DANA SPICER®
Off-Highway Products

Service Manual

Axle 114

ASM–0006E
July 2015

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INTRODUCTION

The efficiency and continued operation of mechanical units depend on constant, correct maintenance and also on efficient repair work, should there be a break-down or malfunction. The instructions contained in this manual have been based on a complete overhaul of the unit. However, it is up to the mechanic to decide whether or not it is necessary to assemble only individual components, when partial repair work is needed. The manual provides a quick and sure guide which, with the use of photographs and diagrams illustrating the various phases of the operations, allows accurate work to be performed.All the information needed for correct disassembly, checks and assembly of each individual component is set out below. In order to remove the differential unit from the vehicle, the manuals provided by the vehicle manufacturer should be consulted. In describing the following operations it is presumed that the unit has already been removed from the vehicle.

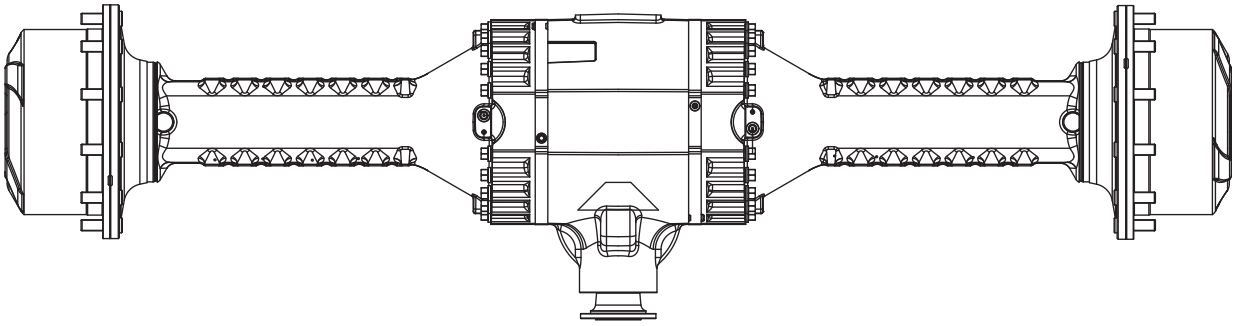
IMPORTANT: In order to facilitate work and protect both working surfaces and operators, it is advisable to use proper equipment such as: trestles or supporting benches, plastic or copper hammers, appropriate levers, pullers and specific spanners or wrenches. Before going on to disassemble the parts and drain the oil, it is best to thoroughly clean the unit, removing any encrusted or accumulated grease.

INTRODUCTORY REMARKS: All the disassembled mechanical units should be thoroughly cleaned with appropriate products and restored or replaced if damage, wear, cracking or seizing have occurred. In particular, thoroughly check the condition of all moving parts (bearings, gears, ring gear and pinion, shafts) and sealing parts (o-rings, oil shields) which are subject to major stress and wear. In any case, it is advisable to replace the seals every time a component is overhauled or repaired. During assembly, the sealing rings must be lubricated on the sealing edge. In the case of the ring gear and pinion, replacement of one component requires the replacement of the other one. During assembly, the prescribed pre-loading, backlash and torque of parts must be maintained.

SPECIFIC EQUIPMENT AND SPARE PARTS: The drawings of all specific tools required for maintenance and repair work can be found at the end of this manual ; spare parts may be ordered either from the vehicle manufacturer or directly from the Service Centers or Authorized Distributors of Dana Holding.

SPECIFICATIONS

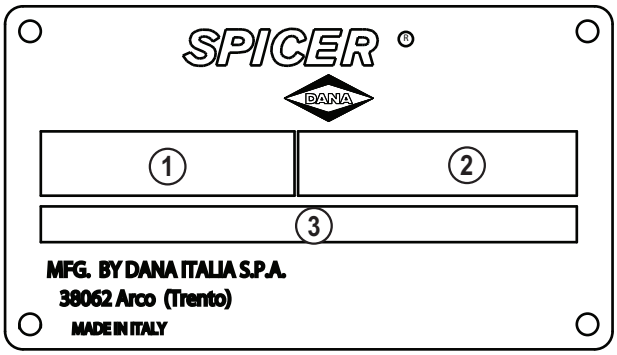
DEFINITION OF VIEWPOINTS



RIGHT SIDE
LATO DESTRO
RECHTE SEITE
LADO DERECHO
COTE DROITE

LEFT SIDE
LATO SINISTRO
LINKE SEITE
LADO IZQUIERDO
COTE GAUCHE

DATA PLATE



1 - Type and model unit - modification index

2 - Serial number

3 - Lubricant

CONVERSION TABLES

UNITS OF PRESSURE

	Atm	Bar	MPa	Pa	PSI
Atm	1	1	0,1	10^5	14,4
Bar	1	1	0,1	10^5	14,4
MPa	10	10	1	10^6	144
Pa	0,00001	0,00001	10^{-6}	1	-
PSI	-	-	-	-	1

UNIT OF WEIGHT

	N	daN	kN	kg	lbs
1N	1	0,1	0,001	0,102	0,225
1daN	10	1	0,01	1,02	2,25
1kN	1000	100	1	102	225
1kg	9,81	0,981	0,00981	1	2,205

UNITS OF TORQUE

	N·m	daN·m	kN·m	kg·m	lb·in
1N·m	1	0,1	0,001	0,102	8,854
1daN·m	10	1	0,01	1,02	88,54
1kN·m	1000	100	1	102	8854
1kg·m	9,81	0,981	0,00981	1	86,8
1 lb·in	0,1129	0,01129	0,0001129	0,01152	1

TORQUE SPECIFICATIONS

COARSE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
M6 x 1 mm	9,5 – 10,5 N·m	10,5 – 11,5 N·m	14,3 – 15,7 N·m	15,2 – 16,8 N·m	16,2 – 17,8 N·m	18,1 – 20 N·m
M8 x 1,25 mm	23,8 – 26,2 N·m	25,6 – 28,4 N·m	34,2 – 37,8 N·m	36,7 – 40,5 N·m	39 – 43 N·m	43,7 – 48,3 N·m
M10 x 1,5 mm	48 – 53 N·m	52 – 58 N·m	68 – 75 N·m	73 – 81 N·m	80 – 88 N·m	88 – 97 N·m
M12 x 1,75 mm	82 – 91 N·m	90 – 100 N·m	116 – 128 N·m	126 – 139 N·m	139 – 153 N·m	152 – 168 N·m
M14 x 2 mm	129 – 143 N·m	143 – 158 N·m	182 – 202 N·m	200 – 221 N·m	221 – 244 N·m	238 – 263 N·m
M16 x 2 mm	200 – 221 N·m	219 – 242 N·m	283 – 312 N·m	309 – 341 N·m	337 – 373 N·m	371 – 410 N·m
M18 x 2,5 mm	276 – 305 N·m	299 – 331 N·m	390 – 431 N·m	428 – 473 N·m	466 – 515 N·m	509 – 562 N·m
M20 x 2,5 mm	390 – 431 N·m	428 – 473 N·m	553 – 611 N·m	603 – 667 N·m	660 – 730 N·m	722 – 798 N·m
M22 x 2,5 mm	523 – 578 N·m	575 – 635 N·m	746 – 824 N·m	817 – 903 N·m	893 – 987 N·m	974 – 1076 N·m
M24 x 3 mm	675 – 746 N·m	732 – 809 N·m	950 – 1050 N·m	1040 – 1150 N·m	1140 – 1260 N·m	1240 – 1370 N·m
M27 x 3 mm	998 – 1103 N·m	1088 – 1202 N·m	1411 – 1559 N·m	1539 – 1701 N·m	1710 – 1890 N·m	1838 – 2032 N·m
M30 x 3,5 mm	1378 – 1523 N·m	1473 – 1628 N·m	1914 – 2115 N·m	2085 – 2305 N·m	2280 – 2520 N·m	2494 – 2757 N·m

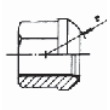
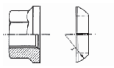
FINE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
M8 x 1 mm	25,7 – 28,3 N·m	27,5 – 30,5 N·m	36,2 – 39,8 N·m	40 – 44 N·m	42,8 – 47,2 N·m	47,5 – 52,5 N·m
M10 x 1,25 mm	49,4 – 54,6 N·m	55,2 – 61 N·m	71,5 – 78,5 N·m	78 – 86 N·m	86 – 94 N·m	93 – 103 N·m
M12 x 1,25 mm	90 – 100 N·m	98 – 109 N·m	128 – 142 N·m	139 – 154 N·m	152 – 168 N·m	166 – 184 N·m
M12 x 1,5 mm	86 – 95 N·m	94 – 104 N·m	120 – 132 N·m	133 – 147 N·m	143 – 158 N·m	159 – 175 N·m
M14 x 1,5 mm	143 – 158 N·m	157 – 173 N·m	200 – 222 N·m	219 – 242 N·m	238 – 263 N·m	261 – 289 N·m
M16 x 1,5 mm	214 – 236 N·m	233 – 257 N·m	302 – 334 N·m	333 – 368 N·m	361 – 399 N·m	394 – 436 N·m
M18 x 1,5 mm	312 – 345 N·m	342 – 378 N·m	442 – 489 N·m	485 – 536 N·m	527 – 583 N·m	580 – 641 N·m
M20 x 1,5 mm	437 – 483 N·m	475 – 525 N·m	613 – 677 N·m	674 – 745 N·m	736 – 814 N·m	808 – 893 N·m
M22 x 1,5 mm	581 – 642 N·m	637 – 704 N·m	822 – 908 N·m	903 – 998 N·m	998 – 1103 N·m	1078 – 1191 N·m
M24 x 2 mm	741 – 819 N·m	808 – 893 N·m	1045 – 1155 N·m	1140 – 1260 N·m	1235 – 1365 N·m	1363 – 1507 N·m
M27 x 2 mm	1083 – 1197 N·m	1178 – 1302 N·m	1520 – 1680 N·m	1672 – 1848 N·m	1834 – 2027 N·m	2000 – 2210 N·m
M30 x 2 mm	1511 – 1670 N·m	1648 – 1822 N·m	2138 – 2363 N·m	2332 – 2577 N·m	2565 – 2835 N·m	2788 – 3082 N·m

TORQUE SPECIFICATIONS

WHEEL NUT TIGHTENING TORQUES

Wheel nut tightening torques recommended from rim's O.E.M. with reference to the quality of the rim's material.

WHEEL NUT TIGHTENING TORQUES				
CHARACTERISTICS	ILLUSTRATION	WHEEL STUD THREAD	RECOMMENDED WHEEL NUTS TORQUE	
			RIM MATERIAL QUALITY	
			ST 37	**ST 52
WHEEL NUTS WITH INTEGRATED SPHERICAL COLLAR		M18X1,5 mm	330 N·m	460 N·m
		M20X1,5 mm	490 N·m	630 N·m
		M22X1,5 mm	630 N·m	740 N·m
FLAT COLLAR WHEEL NUTS WITH SEPARATE SPHERICAL LOCK WASHER		M18X1,5 mm	270 N·m	360 N·m
		M20X1,5 mm	360 N·m	450 N·m
		M22X1,5 mm	460 N·m	550 N·m
WHEEL NUTS WITH INTEGRATE SEAT CAPTIVE WASHER		M18X1,5 mm	260 N·m	360 N·m
		M20X1,5 mm	350 N·m	500 N·m
		M22X1,5 mm	450 N·m	650 N·m

****RIM'S MATERIAL ST 52 IS RECOMMENDED BY DANA ON AXLE APPLICATIONS. IT IS THE OPTIMUM MATERIAL FOR TIGHTENING THE RIM TO THE HUB.**

NOTE:

The wheel nut tightening torque is related only on nut thread and stud thread dry. (Without oil or any lubricant).

NOTE:

The wheel nut tightening torque takes into consideration not only the nut + stud characteristics, but also the quality of the rim material.

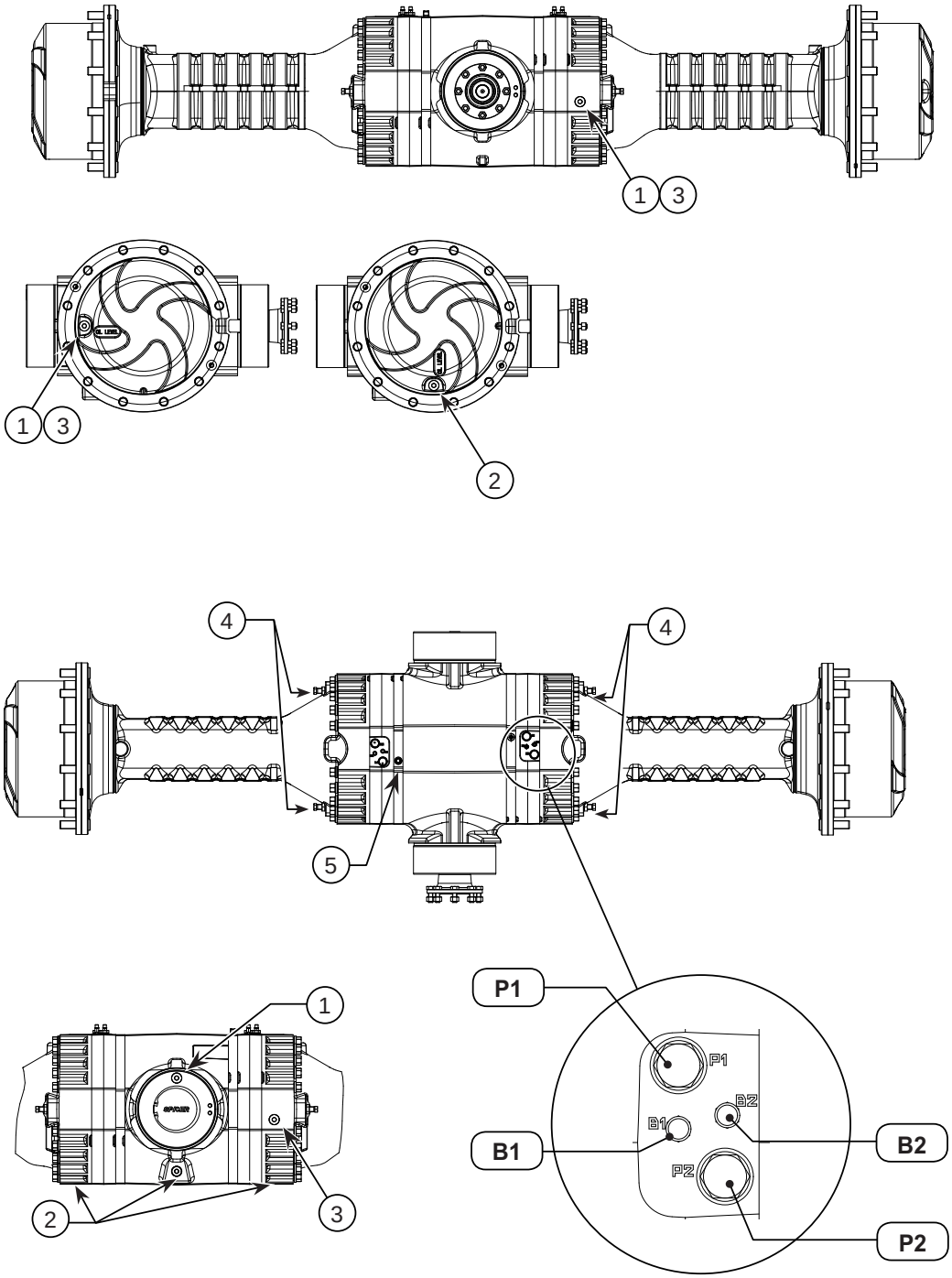
THE DANA OFFICIAL TIGHTENING TORQUE TABLE, THAT IS INCLUDED IN EACH SERVICE MANUAL, SHOWS THE TORQUE FIGURE RELATED TO THE BOLT CHARACTERISTIC ONLY.		
DANA OFFICIAL TIGHTENING TORQUE TABLE		
NUT MATERIAL QUALITY 8.8 & 10.9	STUD MATERIAL QUALITY 10.9	*ALLOW TIGHT TORQUE
M18 x 1,5 mm	M18 x 1,5 N·m	442 - 489 N·m
M20 x 1,5 mm	M20 x 1,5 N·m	613 - 677 N·m
M22 x 1,5 mm	M22 x 1,5 N·m	822 - 908 N·m

***THE TORQUE FIGURE ON NUT AND STUD COUPLING MUST BE RELATED ON STUD MATERIAL QUALITY (DANA AXLES ARE 10.9 ONLY).**

MAINTENANCE

MAINTENANCE POINTS

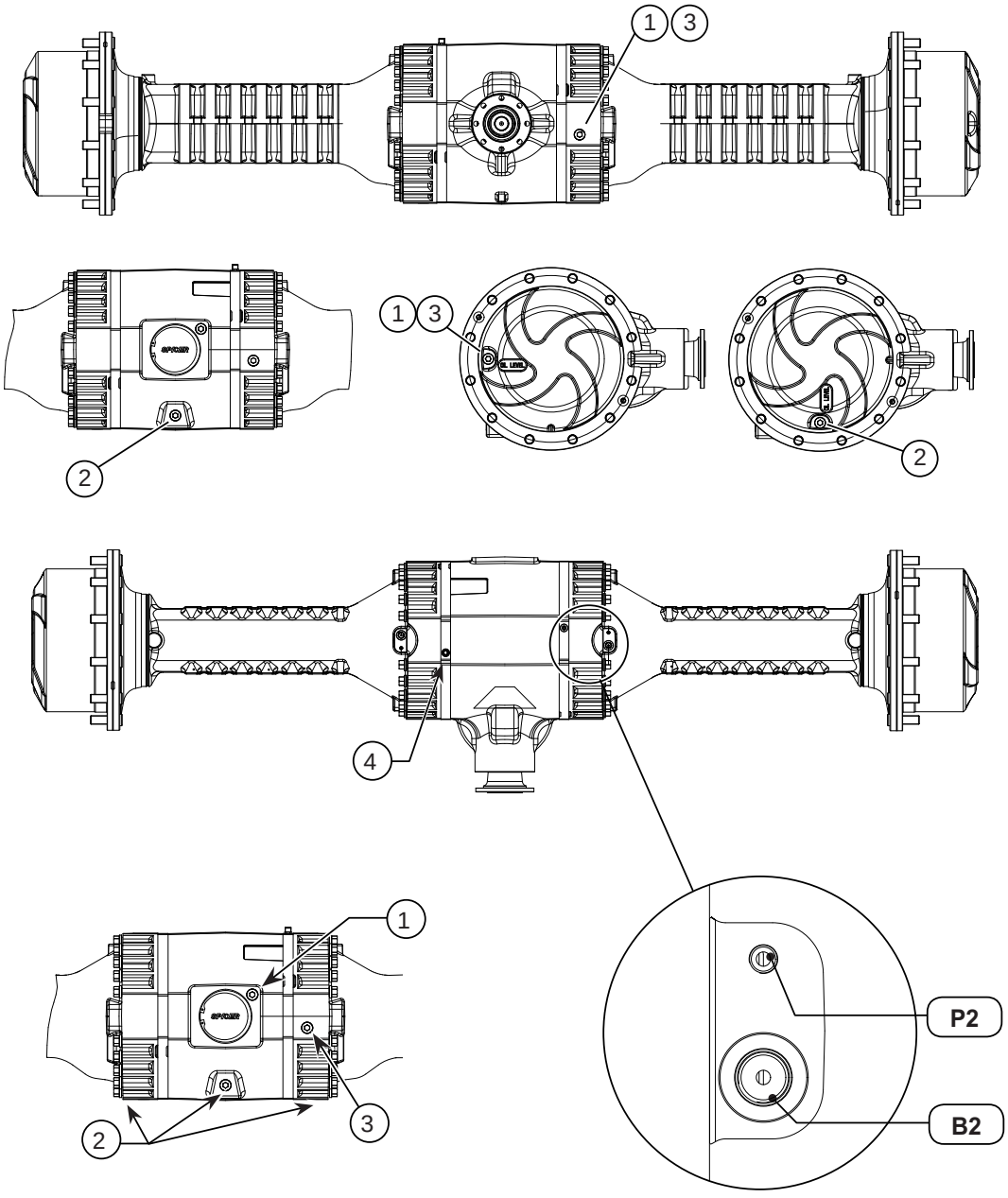
AXLE MODEL WITH SERVICE BRAKE AND NEGATIVE PARKING BRAKE



1 - Oil filling plug
2 - Oil draining plug
3 - Check level plug
4 - Release screw for negative brake
5 - Breather

P1 - Connector for negative brake
P2 - Connector for hydraulic service brake
B1 - Bleeding screw for negative brake
B2 - Bleeding screw for hydraulic service brake

AXLE MODEL WITH SERVICE BRAKE



1 - Oil filling plug
2 - Oil draining plug
3 - Check level plug
4 - Breather

P2 - Connector for hydraulic service brake
B2 - Bleeding screw for hydraulic service brake

OIL DRAINING MANDATORY PROCEDURE

⚠WARNING

- Do not attempt any maintenance if the axle is hot (40-50°C / 104-122°F). Hot oil and components can cause personal injury. Avoid skin contact. Wear protective gloves and glasses.
- Make sure all fluids are contained during inspection, maintenance, tests, adjustment and repair of the product. Prepare a suitable container to collect the fluid before removing any component containing fluids. Dispose of all fluids following legal and local regulations.

CENTRAL HOUSING

Before draining oil it is mandatory to loosen the oil filling plug or the breather (if present), and wait until the internal pressure is completely released. Remove the oil draining plug and drain oil only when the pressure is completely released.

PLANETARY GEAR REDUCTION

Before draining oil it is mandatory to rotate the planetary gear reduction in order to move the oil plug in filling position, then loosen the oil plug and wait until the internal pressure is completely released. Remove the oil plug and drain oil only when the pressure is completely released.

MAINTENANCE INTERVALS

OPERATION	COMPARTMENT	1ST CHANGE / CHECK (whs)	FREQUENCY (whs)	LUBRICANTS	REMARKS
Oil level check	All	10 whs	Monthly	For details see below	Clean carefully oil plug magnet
Oil Change	Differential	100 - 250 whs max. *	1000 whs	Central body standard bevel gears - UTTO (API GL4), or gear: J20/C, MF M1143, or gear: SAE80W/90 (API GL4 or GL5)	If with limited slip differential, and/or wet brakes, use LS additivated oils. Clean carefully oil plug magnet.
				Central body hypoid bevel gears - SAE80W/90 (API GL5)	
	Hub Reduction	100 - 250 whs max. *		UTTO (API GL4) J20/C; or gear: SAE80W/90 (API GL4 or GL5)	Clean carefully oil plug magnet.
				Gears with wet discs clutch - ATF GM Dexron IIE, Dexron III	
	Dropbox (if any)	100 - 250 whs max. *		Only gears - UTTO J20/C, or gear: SAE80W/90 (API GL4 or GL5)	Clean carefully oil plug magnet. * in accordance with Machine Service requirements
Adjustment	Negative brake (SAHR)	100 whs	Every 500 whs	For hydraulic actuations (brakes, SAHR, 100% diff. lock, etc.) use ATF oil e.g. GM Dexron IIE, Dexron III	Not applicable
	Service brake				DOT brake fluids oils are NOT compatible w/std oils
Tightening	Wheel nuts	10 whs	Every 200 whs	No lubricant allowed	Check for any damage or corrosion of treads or mating surfaces
Greasing	King Pin Tapered Bearings	10 whs	Normal work – Weekly or Severe duty – Daily	NLGI2 EP or NLGI3 EP	Supply grease until clean grease is visible from outside. Grease performance level acc. to: According to DIN 51825 level KP2K-30 (NLGI2) or KP3K-20 (NLGI3); ASTM D4950 NLGI2 GC-LB
	Seals	10 whs			
	King Pin Bushings	10 whs		NLGI2 EP or NLGI3 EP with Moly Addittive	
	Trunnion Bushings	10 whs			

In case of severe duty, half oil change intervals must be applied.
In case of extreme enviroments, chatter noise, reduce oil change intervals accordingly.
In case of extremely low ambient temperatures (<-20°C), use appropriate oils w/ low viscosity: UTTO J20/D (std Bevel Gears), SAE 75W/90 API GL5 LS (Hypoid Bevel Gears: models 192, 193, 194).
API GL5: Acc. To MIL L-2105-B
See PSB 00279 (latest update) for more info regarding lubricants and viscosity grades.

LUBRICANT & SEALANT SPECIFICATIONS

1 - Locking, sealing and lubricating materials referred to in this manual are the same used in the shop-floor.

2 - The table below gives an account of the typical applications of each single material, in order to facilitate replacement with similar products marketed by different brand names with different trade marks.

LOCTITE 242

Anaerobic product apt to prevent the loosening of screws, nuts and plugs. Used for medium-strength locking. Before using it, completely remove any lubricant by using the specific activator.

LOCTITE 243

The oleocompatible alternative to 242. Does not require the activation of lubricated surfaces.

LOCTITE 270

Anaerobic product for very-high strength locking of screws and nuts. Before using it, completely remove any lubricant by using the specific activator.

To remove parts, it may be necessary to heat them at 80° C approximately.

LOCTITE 275

Anaerobic product suitable for high-strength locking and sealing of large threaded parts, bolts and stud bolts, for pipe sealing and for protecting parts against tampering; suitable for sealing coupling surfaces with a maximum diametrical clearance of 0.25 mm.

LOCTITE 510

Anaerobic product for the hermetic sealing of flanged units and screw holes communicating with fluids. Can seal clearances between flanges up to 0.2 mm.

LOCTITE 577

Quick anaerobic sealant for sealing threaded portions of conical or cylindrical unions up to M80. Before using it, remove any lubricant with the specific activator. After polymerisation, disassembly may result rather difficult, so heating may be necessary for larger diameters.

LOCTITE 638

Anaerobic adhesive for fast and high-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with clearance ranging between 0.1 and 0.25 mm.

LOCTITE 648

Anaerobic adhesive for fast and medium-strength gluing of cylindrical metal joints (hub on shaft). Can glue together parts with radial clearance below 0.1 mm.

AREXONS (REPOSITIONABLE JOINTING COMPOUND FOR SEALS)

Solvent-based sealing compound for elastic seals, drying through evaporation. Used for sealing the outer diameter of sealing rings for rotating shafts with outer metal reinforcement.

SILICONE

Semi-fluid adhesive material used for sealing and filling and to protect components from environmental and physical elements. Polymerises with non-corrosive dampness.

TECNO LUBE/101 (SILICONE-BASED GREASE)

Highly adhesive synthetic grease, with silicone compounds added.

Applied to adjustment screws with hole communicating with oil-type fluids.

Used when frequent adjusting is required.

MOLIKOTE (DOW CORNING)

Lubricating compound containing molybdenum disulphide, used to lubricate articulation pins and to prevent sticking and oxidation of parts that are not lubricated on a regular basis.

(LITHIUM-BASED) GREASE

Applied to bearings, sliding parts and used to lubricate seals or parts during assembly.

SAFETY PRECAUTIONS

1 - During all operations described in this manual, the axle should be fastened onto a trestle, while the other parts mentioned should rest on supporting benches.

2 - When removing one of the arms, an anti-tilting safety trestle should be placed under the other arm.

3 - When working on an arm that is fitted on the machine, make sure that the supporting trestles are correctly positioned and that the machine is locked lengthways.

4 - Do not admit any other person inside the work area; mark off the area, hang warning signs and remove the ignition key from the machine.

5 - Use only clean, quality tools; discard all worn, damaged, lowquality or improvised wrenches and tools. Ensure that all torque wrenches have been checked and calibrated.

6 - During maintenance operations, always wear protective glasses, safety footwear, protective gloves and all P.P.E. (Personal Protective Equipment) in function of the risks which the workers may be exposed to.

7 - Should you stain a surface with oil, remove marks straight away.

8 - Dispose of all lubricants, seals, rags and solvents once work has been completed. Treat them as special waste and dispose of them according to the relative law provisions obtaining in the country where the axles are being overhauled.

9 - Make sure that only weak solvents are used for cleaning purposes; avoid using turpentine, dilutants and toluol, xylolbased or similar solvents; use light solvents such as Kerosene, mineral spirits or water-based, environment friendly solvents.

10 - For the sake of clarity, the parts that do not normally need to be removed have not been reproduced in some of the diagrams.

11 - After repair work has been completed, accurately touch up any coated part that may have been damaged.

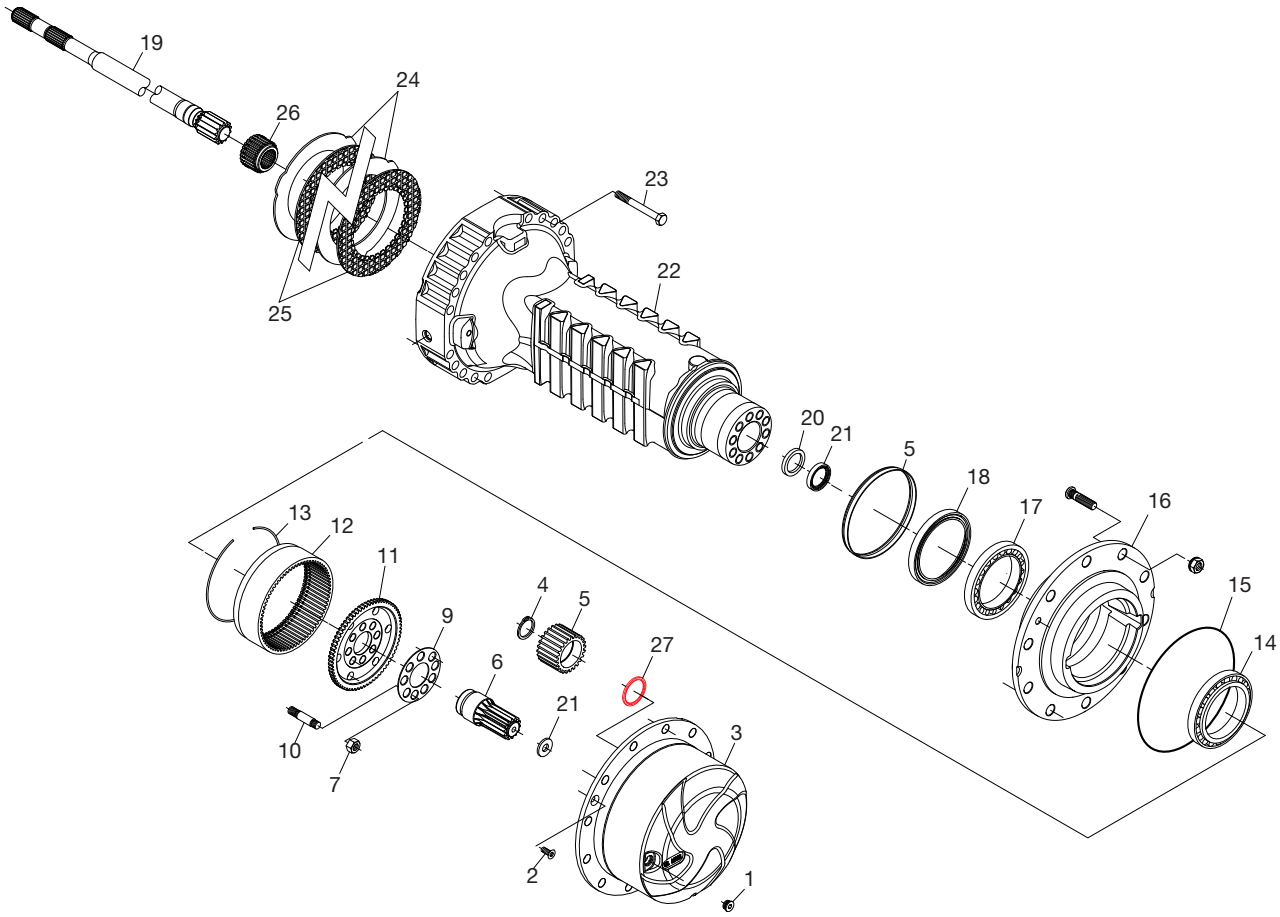
12 - Follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.

13 - Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 13.

DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a situation which, if not avoided, may result in damage to components.
NOTICE	Indicates information which may make product service easier to perform.

PLANETARY REDUCTION

EXPLODED VIEW



ITEM 27 NOT PRESENT ON ALL MODELS

DISASSEMBLY

⚠CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 13.

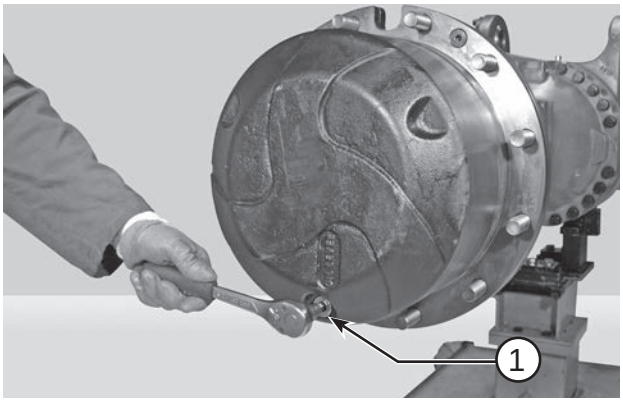


FIGURE 1: Carry out all operations one wheel side at a time. Remove the oil level plug (1) and drain the oil.

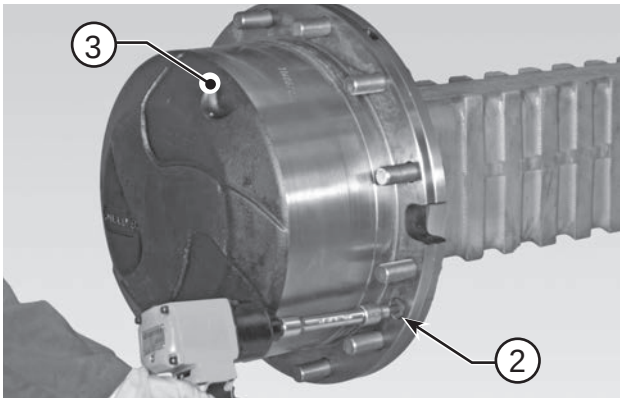


FIGURE 2: Attach a suitable sling to the satellite carrier cover, connect to lifting gear, and tighten. The approximate weight of the cover is 67kg (148lb).
Remove the locking screws (2) of planetary cover (3).

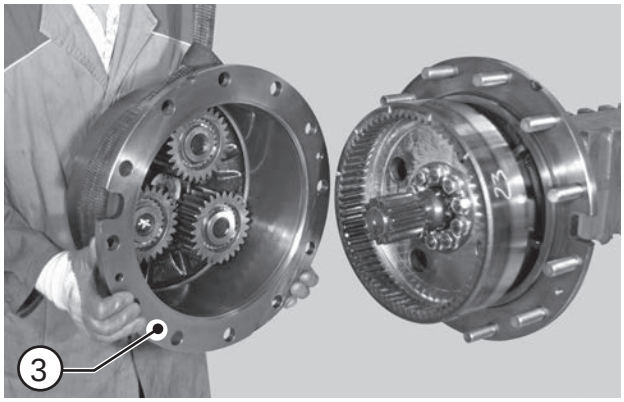


FIGURE 3: Using two screwdrivers or two levers inserted in the slots provided, disjoin the planetary cover (3) away from the wheel hub (16).
Remove the cover (3).

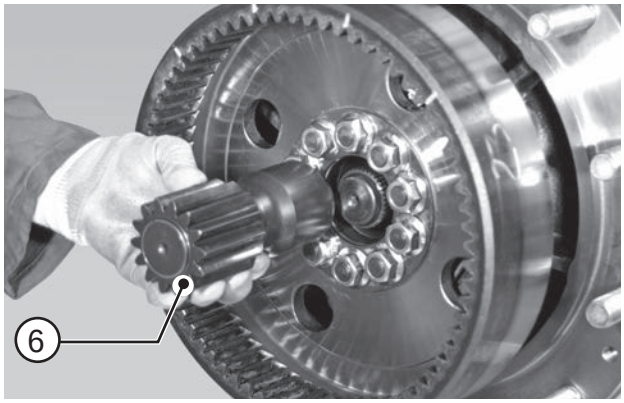


FIGURE 4: Remove the sun gear (6).

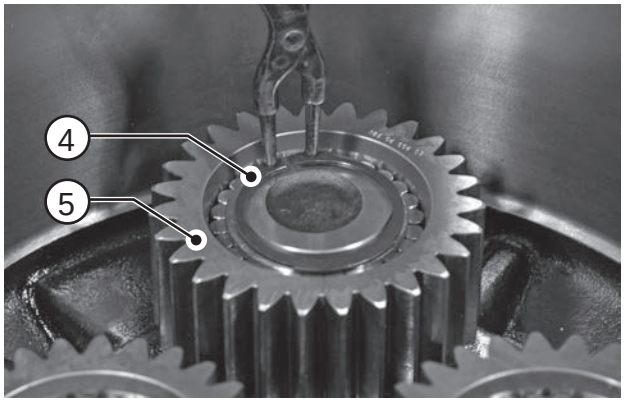


FIGURE 5: Remove the snap rings (4) of the planetary gears (5).

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

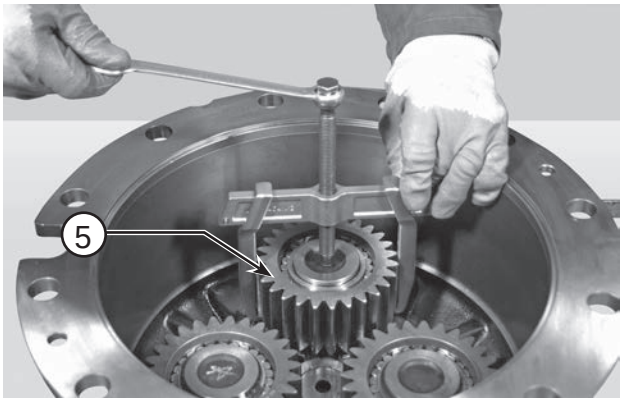


FIGURE 6: Remove the planetary gears (5).

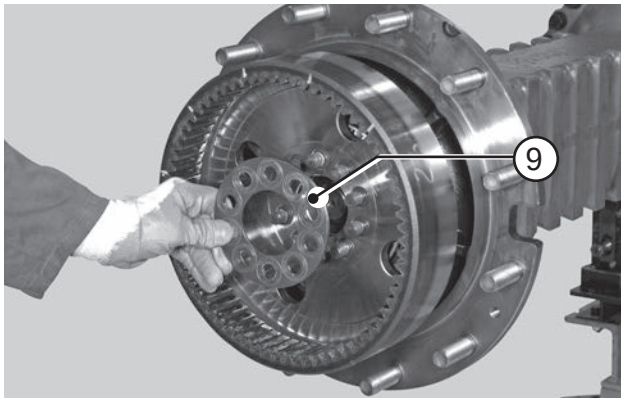


FIGURE 9: Remove the safety flange (9).

FIGURE 7: NOT PRESENT ON ALL MODELS
Remove the spacer (27).

NOTE:

Write down the direction of assembly of the spacer.

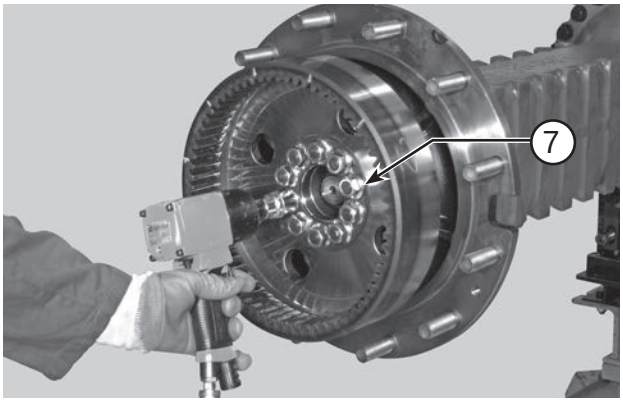


FIGURE 8: Loosen and remove the nuts (7) from the crown flange (11).

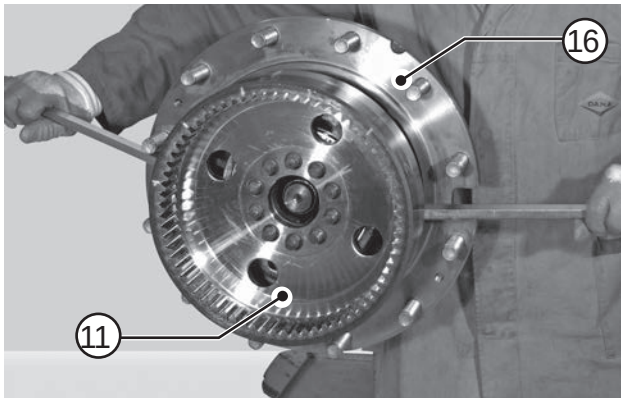


FIGURE 10: Using two screwdrivers or two levers inserted in the slots provided, disengage the crown wheel (11) from the hub (16).
Remove the crown (11).

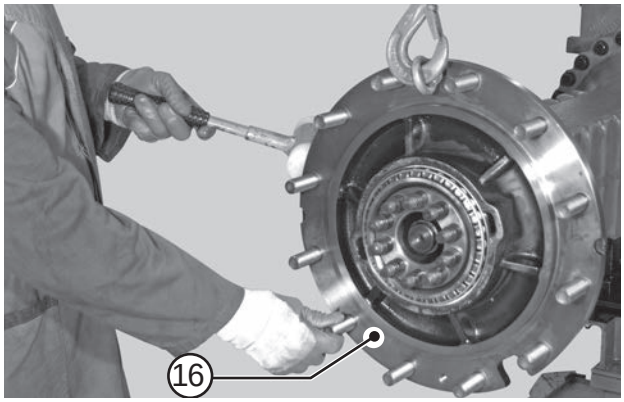


FIGURE 11: Tighten fully into the hole provided a double joint lifting eye size M12, connect to a suitable lifting gear and tension. The approximate weight of the hub is 42kg (92,5lb).
With the help of a hammer, shift the hub (16) and the external bearing (14).

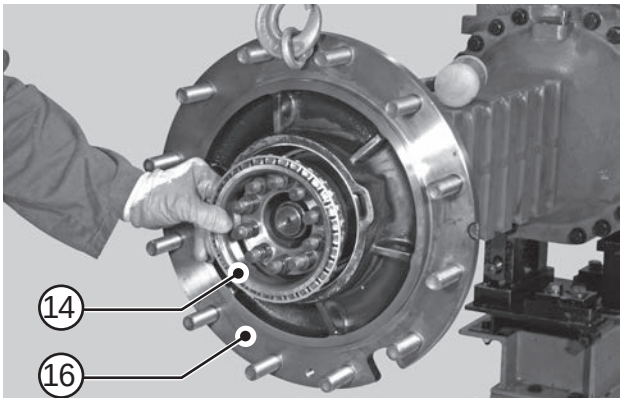


FIGURE 12: Extract the external bearing (14).

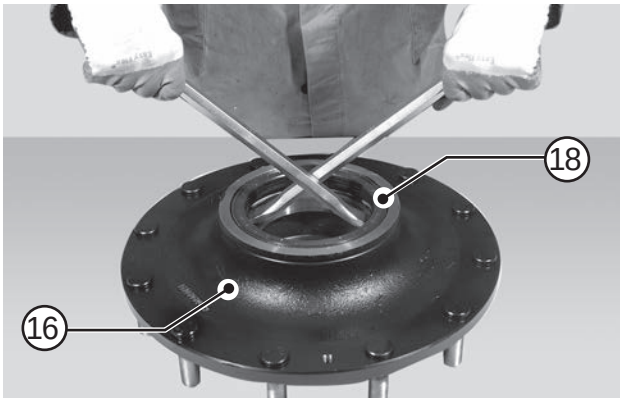


FIGURE 13: Remove the seal ring (18) from the hub (16).

NOTE:

Write down direction of assembly.

⚠CAUTION

The seal ring may not be reused.

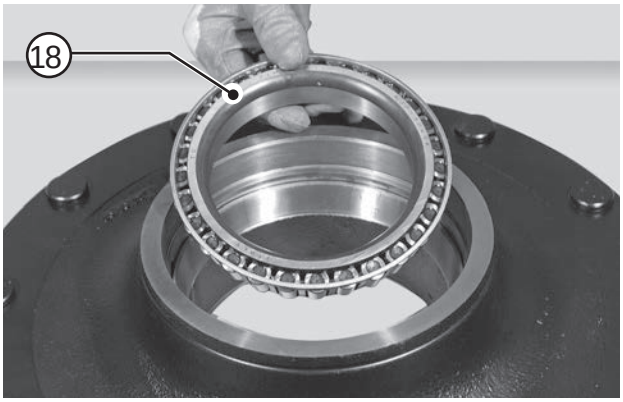


FIGURE 14: Remove the internal bearing (18).

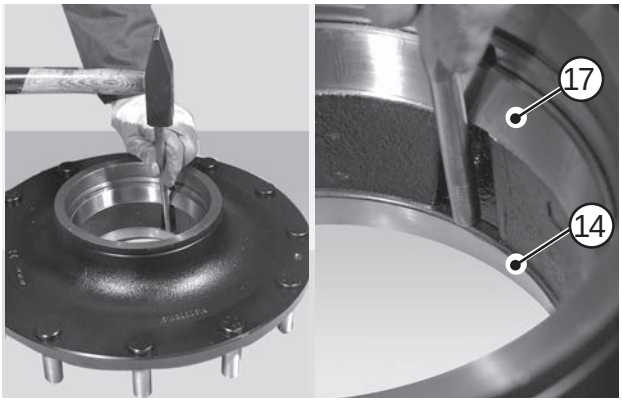


FIGURE 15: Remove the external thrust blocks of bearings (14) and (17), using a pin driver.

NOTE:

Hammer in an alternate sequence to prevent clamping and deformation of the thrust blocks.

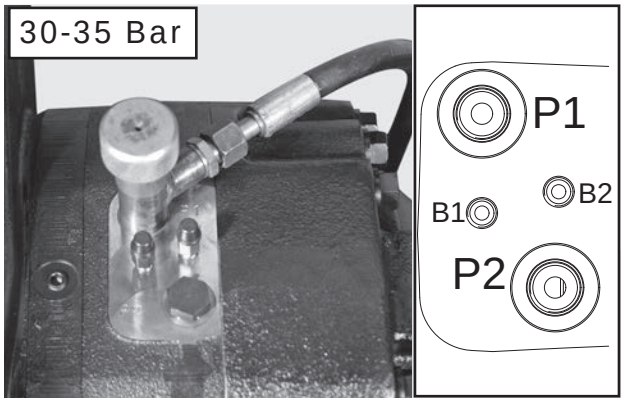


FIGURE 16: ONLY NEGATIVE BRAKE VERSION
Connect an external pump to the union piece “P1“ of the negative brake and introduce a pressure of 30 - 35 bar to eliminate the pressure of the Belleville washers.

⚠WARNING

Hot oil and components can cause personal injury. Avoid skin contact.

NOTE:

Perform all operations on both arms. Remove the oil plug "A" and drain oil.

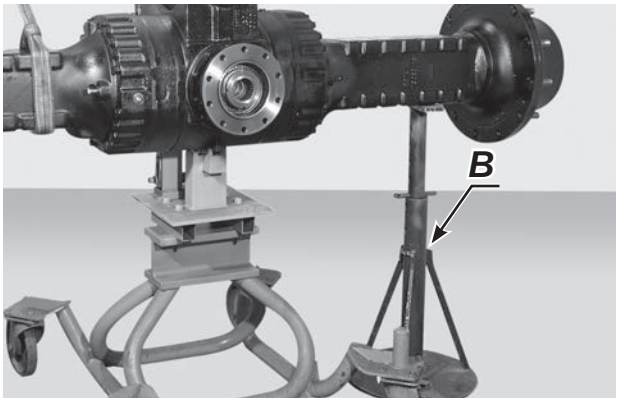


FIGURE 17: If axle is positioned on an overhaul bench, place a safety anti-tilting stand “B” under the arm that remains connected and block wheels, if any.

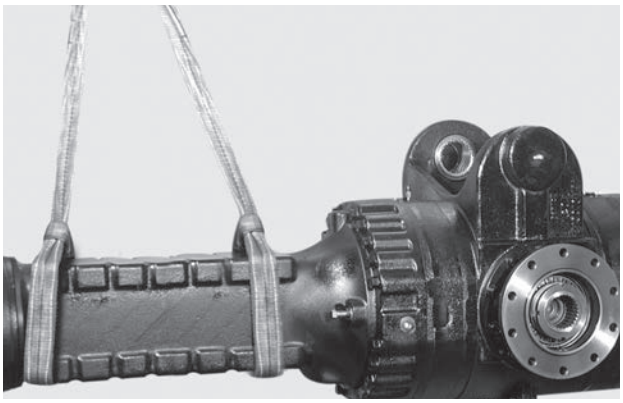


FIGURE 18: Connect a suitable sling to the arm, connect to lifting gear and tighten. The approximate weight of the arm complete with brakes and planetary gears is 351kg (774lb).

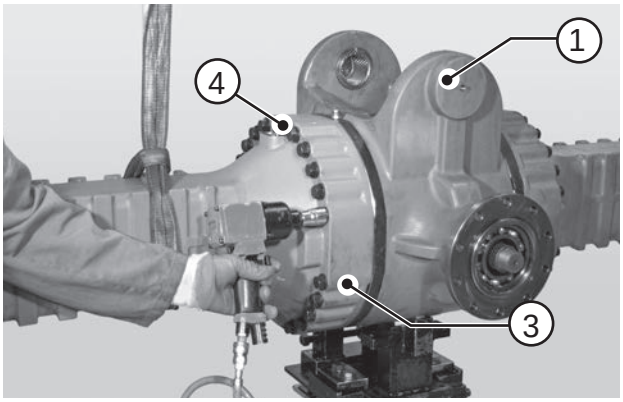


FIGURE 19: Loosen and remove the screws (4) that attach the arm (3) to the central body (6). Remove arm together with brakes and axle shafts; lay down the arm vertically.

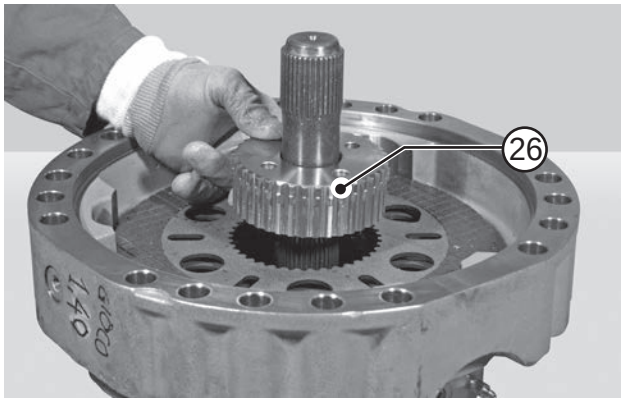


FIGURE 20: Remove the flange (26) complete with the discs. Noting down direction of assembly.
For details, see SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 39.

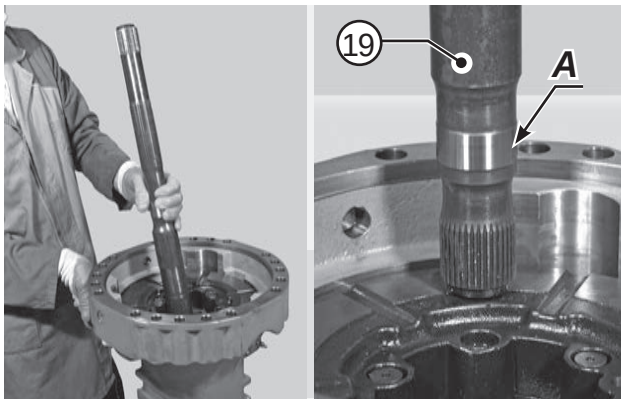


FIGURE 21: Remove the axle shaft (19).

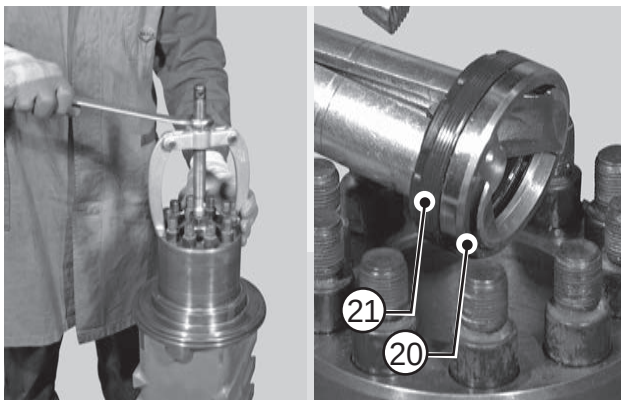


FIGURE 22: Turn the arm over using the lifting gear. The arm was attached to the sling during dismantling. The approximate weight of the arm complete with brakes and planetary gears is 351kg (774lb).
Using an extractor, remove seal ring (21) and guide ring (20).

NOTE:

Write down the direction of assembly of seal ring.

ASSEMBLY

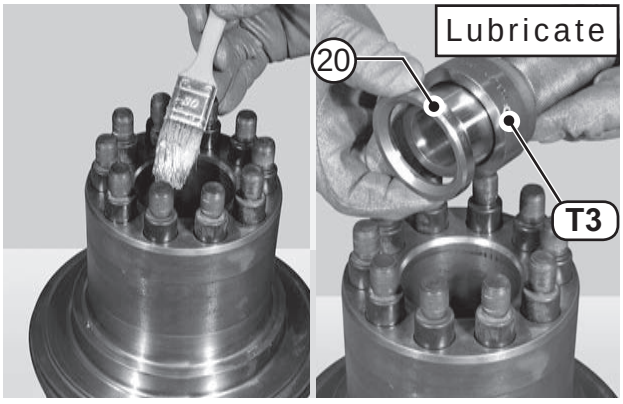


FIGURE 23: Lubricate and fit the guide ring (20) onto tool T3 (See drawing T3 p. 31); install the rings into the arm.

⚠CAUTION

Pay particular attention to the direction of assembly of the rings.

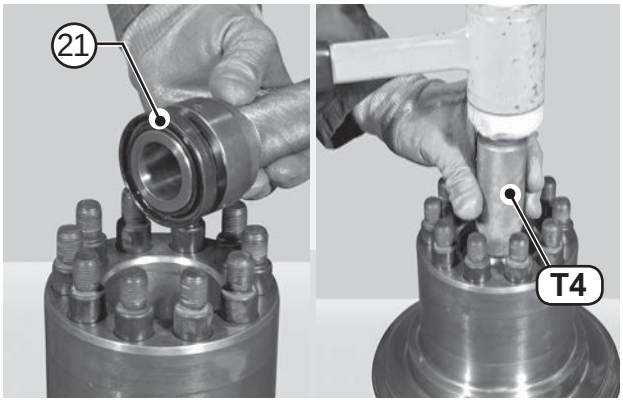


FIGURE 24: Lubricate and fit the seal ring (21) onto tool T4 (See drawing T4 p. 32); install the rings into the arm.

⚠CAUTION

Pay particular attention to the direction of assembly of the rings.

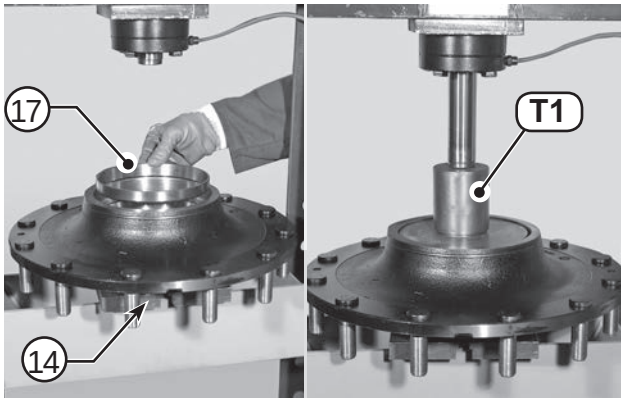


FIGURE 25: Position the wheel hub (16) under a press. Lubricate the seat of the bearing cones (14, 17) and, using tool T1 (See drawing T1 p. 29), install the bearing cup of the bearing cone (14, 17).

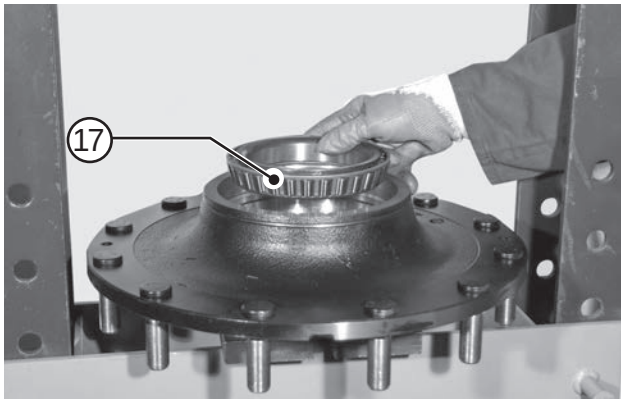


FIGURE 26: Fit the bearing (17) and seal ring (18) into the internal thrust block.

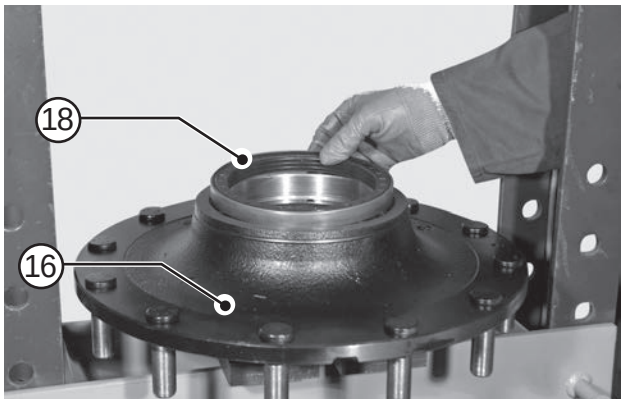


FIGURE 27: Apply a joining compound for seals to the outer surface of the sealing ring (18).
Position the sealing ring (18) in the hub (16).

NOTE:

Verify the ring (18) is correctly oriented.

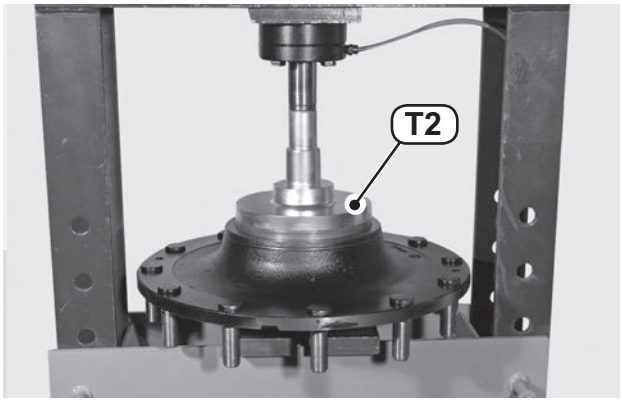


FIGURE 28: Position tool T2 (See drawing T2 p. 30) and press the sealing ring (18) into its seat.

⚠CAUTION

Check the flatness of seal ring.

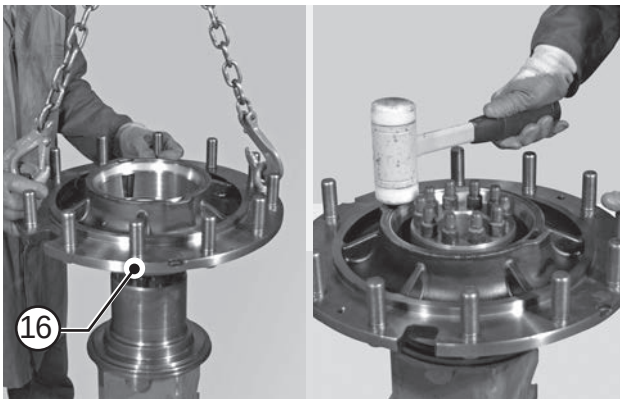


FIGURE 29: Insert and tighten two doublejoint lifting eyes size M12. Connect to suitable lifting gear and tighten. The approximate weight of the hub is 42 kg (92.5 lb). Install the wheel hub (16).

NOTE:

Move the bearing cone to the limit stop by hammering lightly all around the edge.

If assembly is difficult, use a driver with a suitable diameter to seat it.

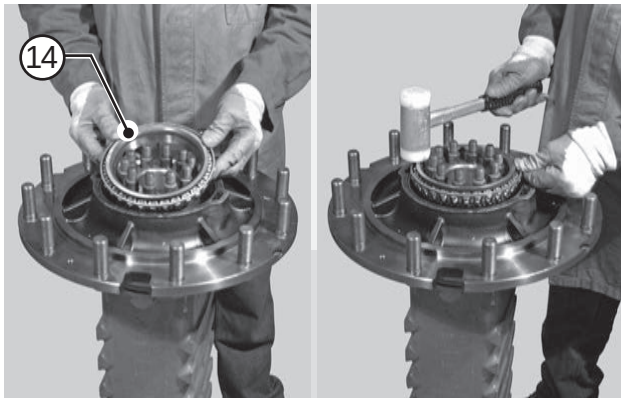


FIGURE 30: Install the external bearing cone (14).

NOTE:

Using a plastic hammer, drive the bearing cone to the limit stop by lightly hammering around the edge.

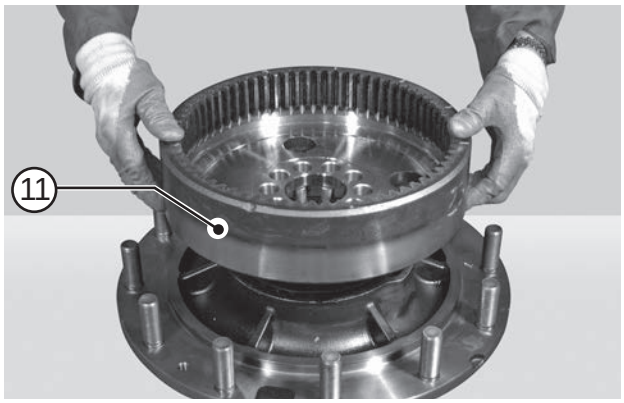


FIGURE 31: Fit the complete crown flange (11).

NOTE:

In order to fasten the flange (11), use a plastic hammer and alternately hammer on several equidistant points.

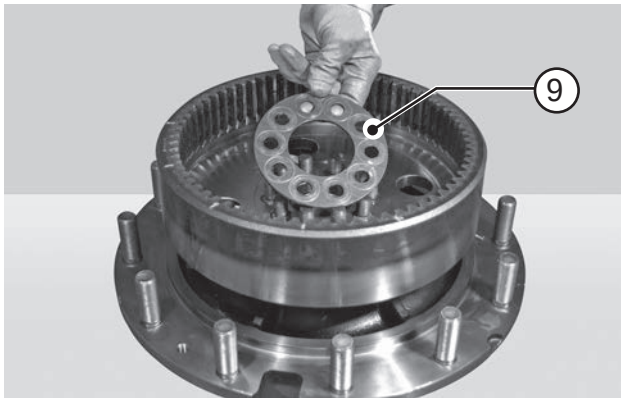


FIGURE 32: Install the security flange (9).

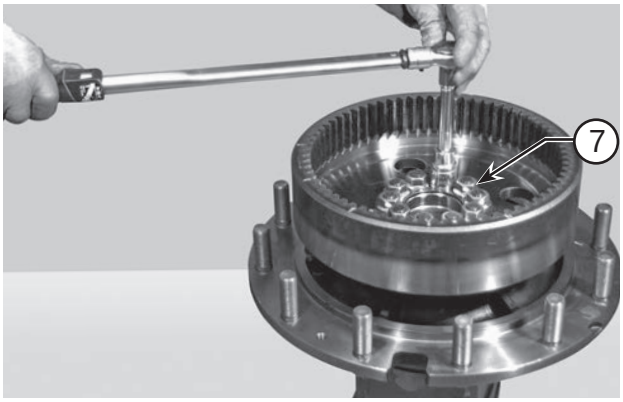


FIGURE 33: Tighten nuts (7) in two stages, using the criss-cross method.
Standard nuts: 214 -236 N·m + Loctite 243
Flanged nuts: 270 - 300 N·m + Driloc

NOTE:

Check the continuous rolling torque on the hub. Torque 15 - 64 Nm.

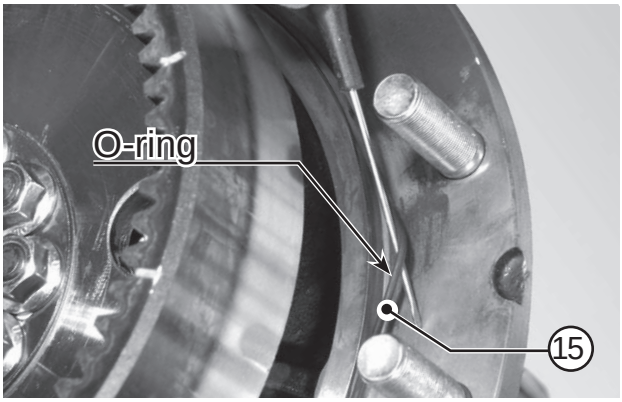


FIGURE 34: Install a new o-ring (15) on the centering diameter of wheel hub. Lubricate the o-ring before fitting.

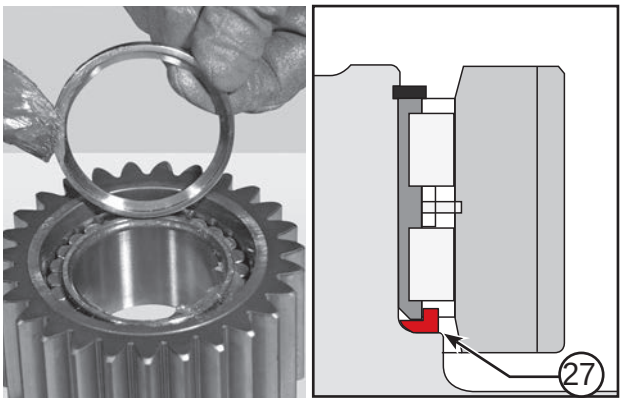


FIGURE 35: NOT PRESENT ON ALL MODELS
Grease the spacer (27) assemble on the satellite gear (5) as shown in the figure. Accurately check the orientation.

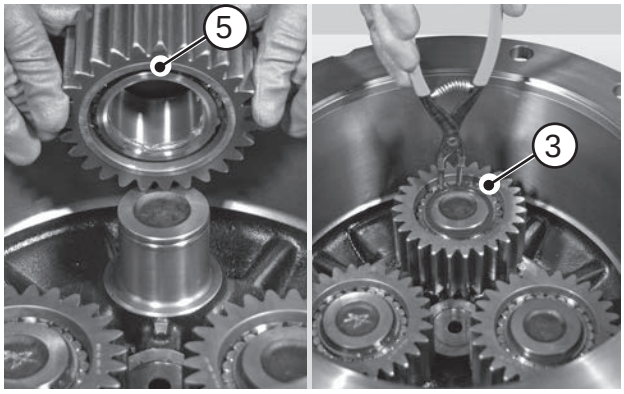


FIGURE 36: Insert the planetary gears (5) into the cover (3). Lock gears (5) into position by installing the snap rings.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

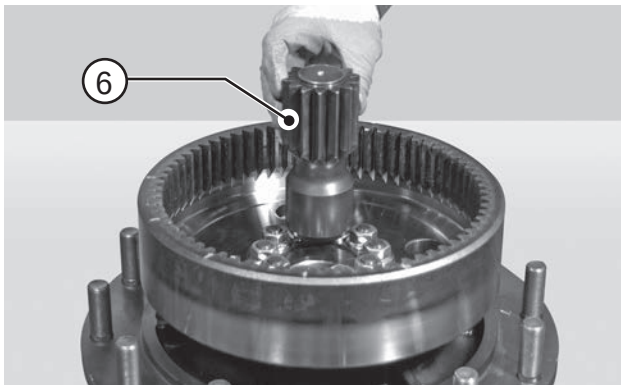


FIGURE 37: Install the solar gear (6).

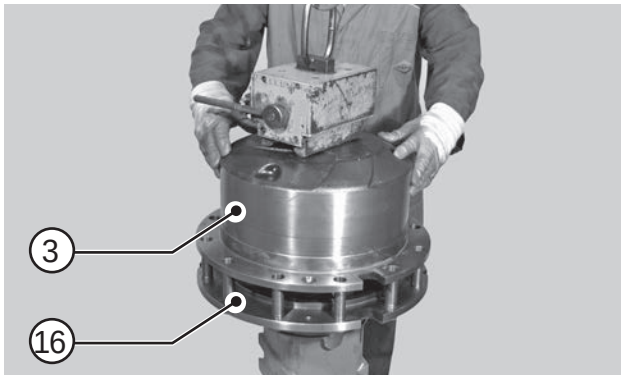


FIGURE 38: Fit the planetary carrier cover (3) onto the hub (16).

⚠CAUTION

Check that the o-ring is in good condition and in position.

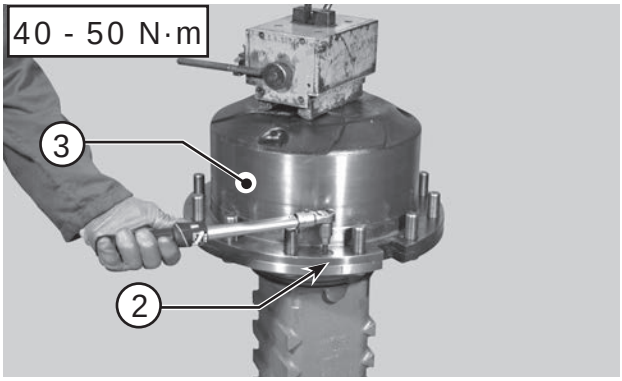


FIGURE 39: Lock the planetary carrier cover (3) by tightening the screws (2). Torque wrench setting for screws: 40 - 50 N·m.

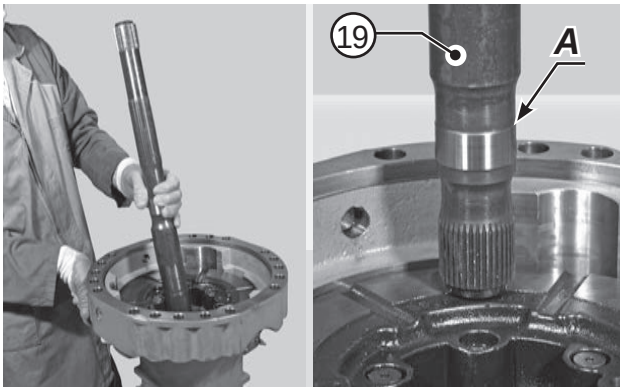


FIGURE 40: Grease sealing face “A” of axle-shaft (19). Install the axle shaft (19) making sure it is properly engaged in the sun gear (6).

NOTE:

Be very careful not to damage the seal ring (21).

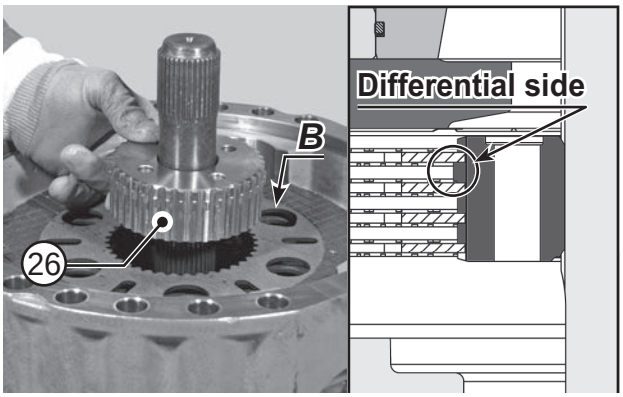


FIGURE 41: 1 - Insert the brake discs (24, 25) in the right sequence, orient them so that the oil circulation holes and the marks "B" are perfectly lined up.
2 - Install the flange (26) on the arm.

NOTE:

The first brake disc (3) to be inserted must be of steel material.

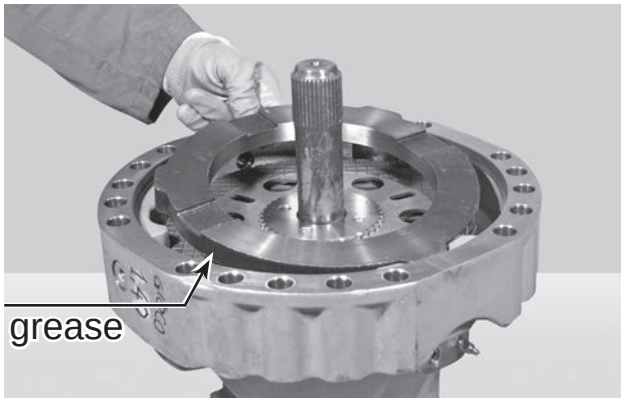


FIGURE 42: Insert the end plate. Before installing the last brake disc and the end plate, spread grease over the contact surfaces to hold them in position while mounting on the central housing.

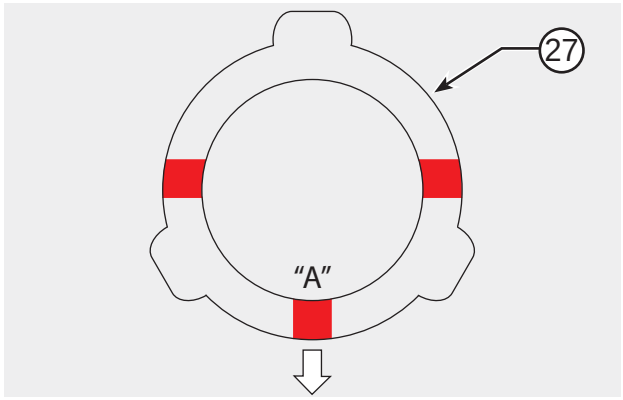


FIGURE 43: Install the end plate (27) with the oil passage notch “A” facing downwards.

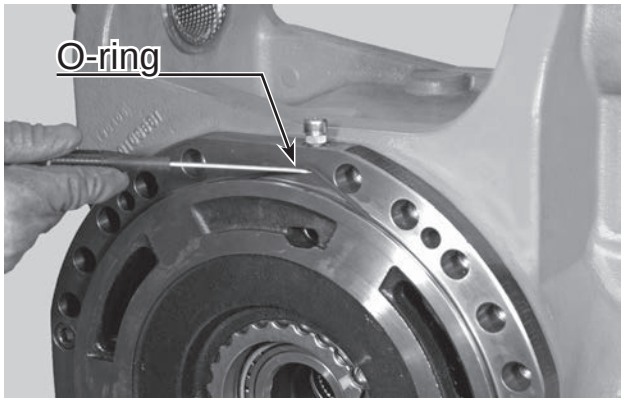


FIGURE 44: Check the condition and position of the cover's o-ring.

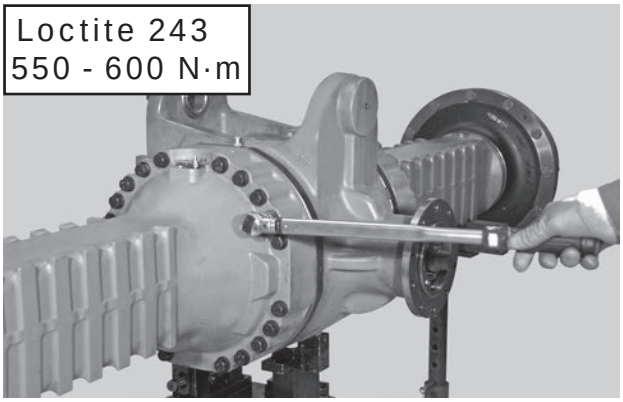


FIGURE 45: The arm was attached to a sling during dismantling.
The approximate weight of the arm complete with brakes and planetary reduction gear is 351kg (774lb).
Install the complete arm.
Apply Loctite 243 to the threads of the screws (3) and tighten to a torque of 550 - 600 N·m.

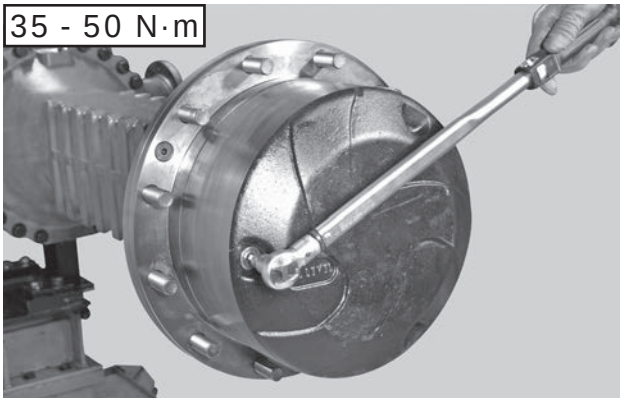
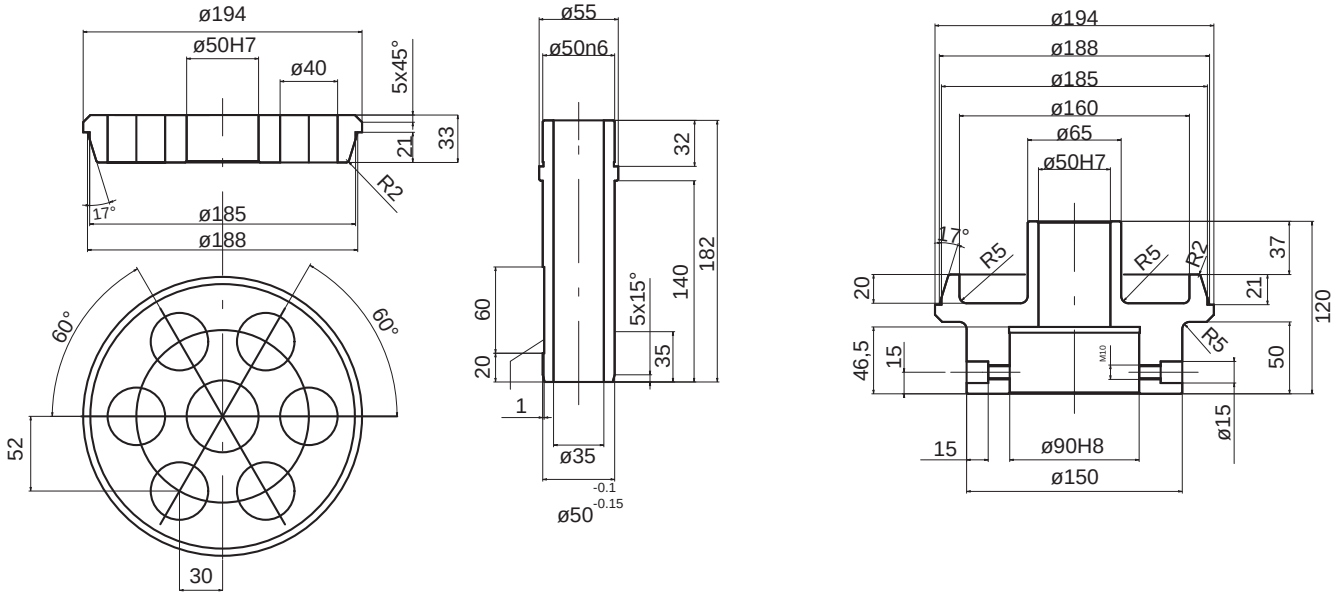


FIGURE 46: Install the oil-level plug (1).
Torque wrench setting for screws: 30 - 50 N·m

SPECIAL TOOLS

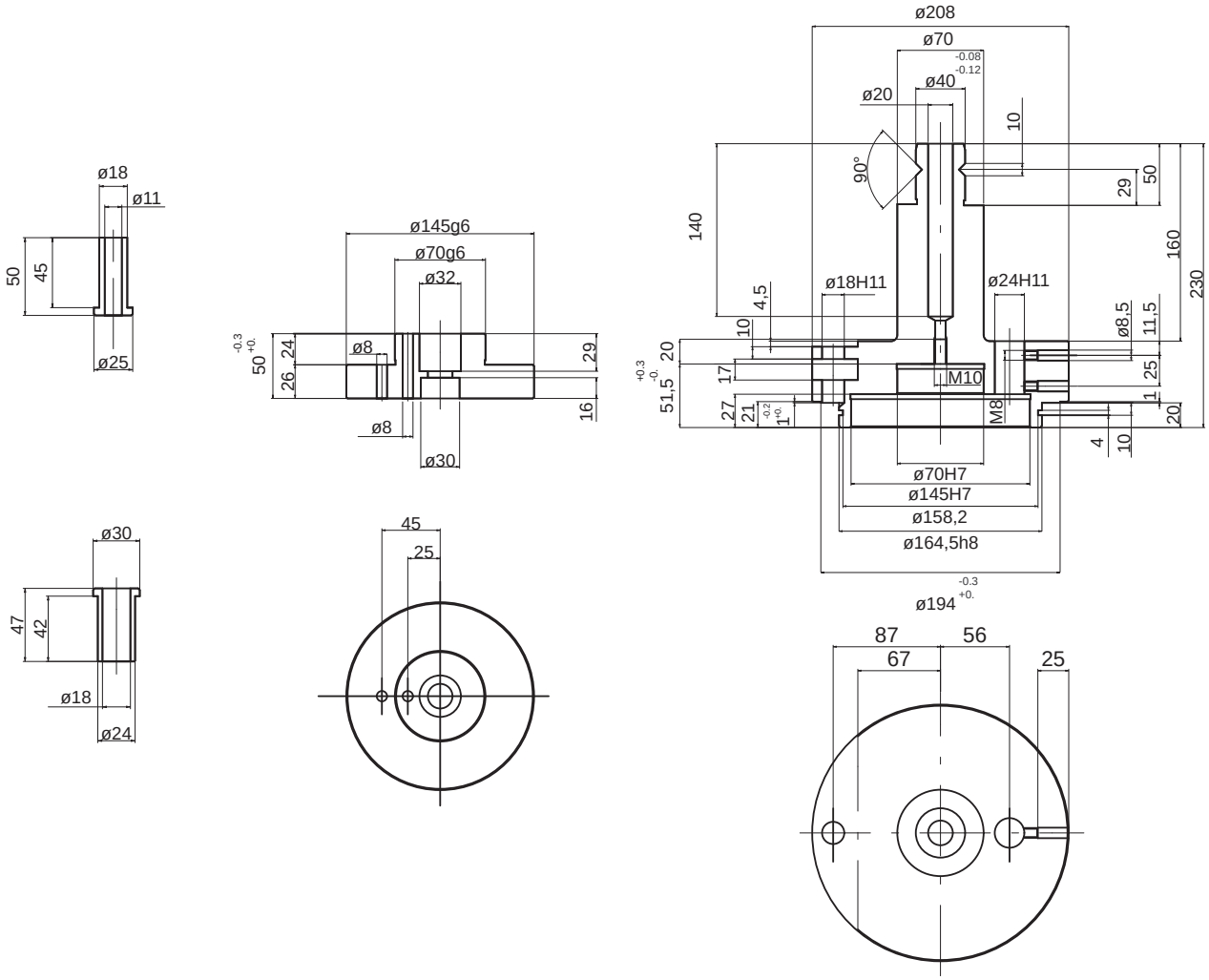
T1

P/N: 910.04.4591



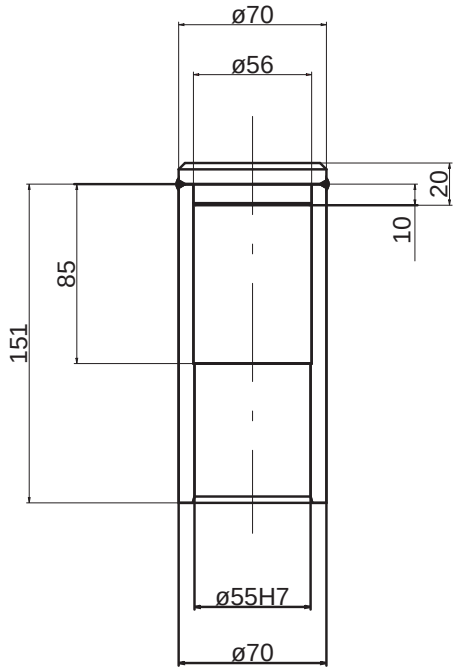
T2

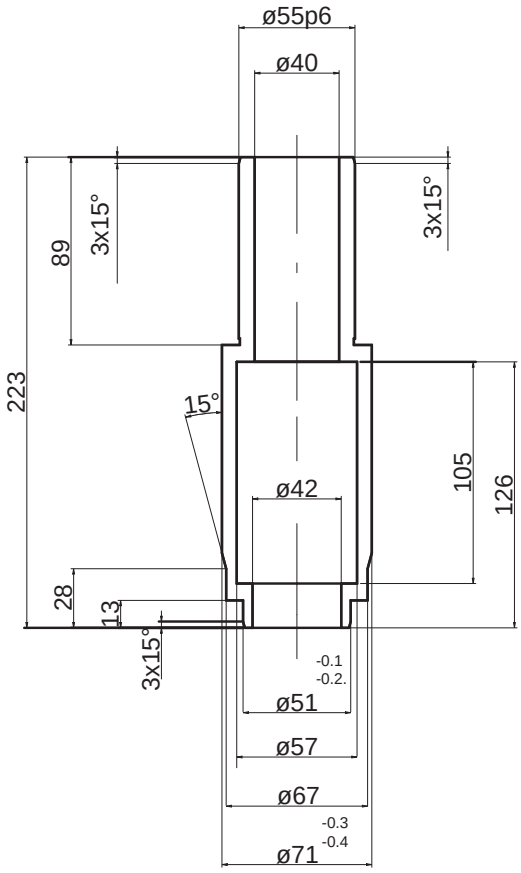
P/N: 910.06.4592



T3

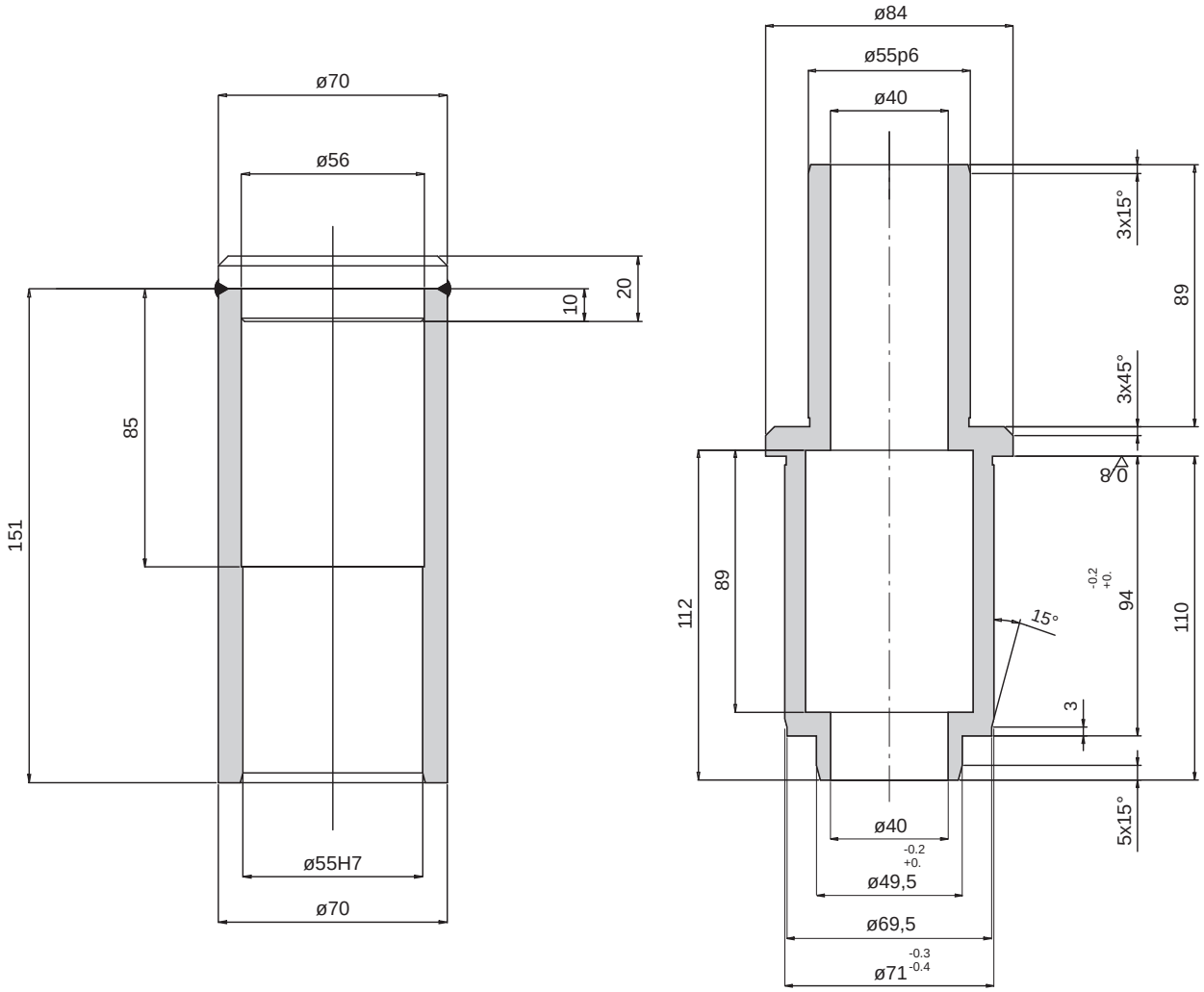
P/N: 910.06.4594





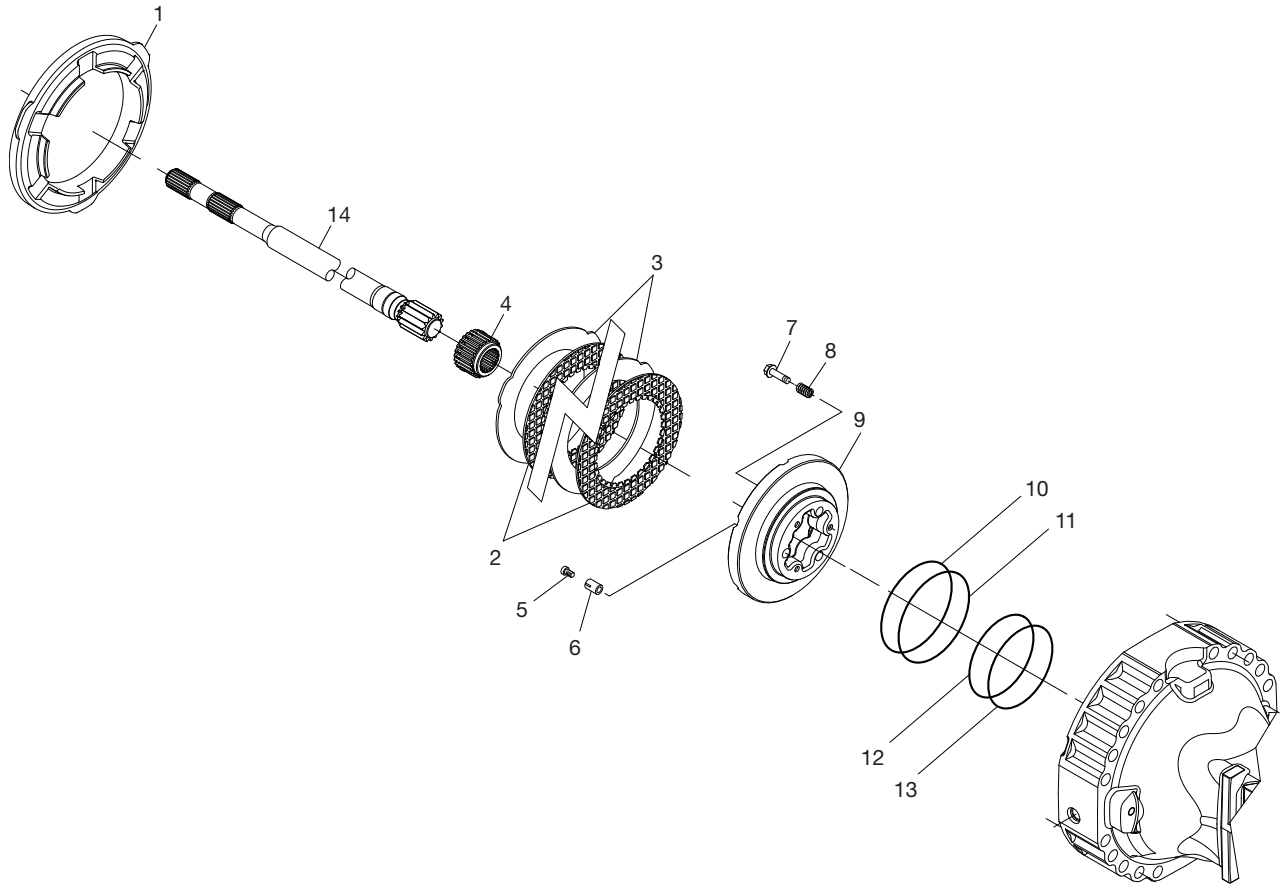
T4

P/N: 910.04.4595



SERVICE BRAKE

EXPLODED VIEW



DISASSEMBLY

⚠ DANGER

Before maintaining brakes, when the axle is installed on the vehicle, follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.

⚠ CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 13.

NOTE:

Perform all operations on both arms. Remove the oil plug "A" and drain oil.

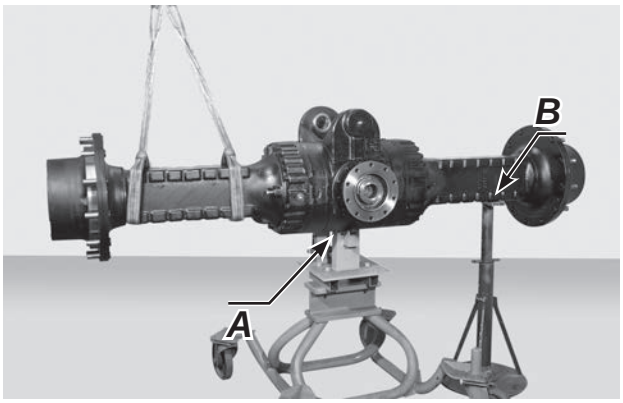


FIGURE 1: If axle is positioned on an overhaul bench, place a safety anti-tilting stand “B” under the arm that remains connected and block wheels, if any.

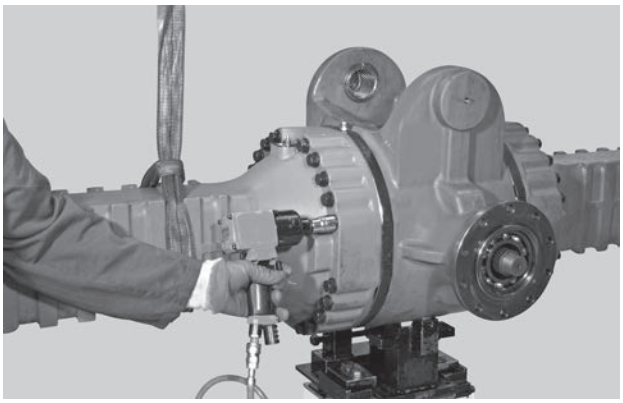


FIGURE 2: Attach a suitable sling to the arm, connect to lifting gear and tighten. The approximate weight of the arm complete with brakes and planetary gears is 351 kg (774 lb). Remove the retainer screws.

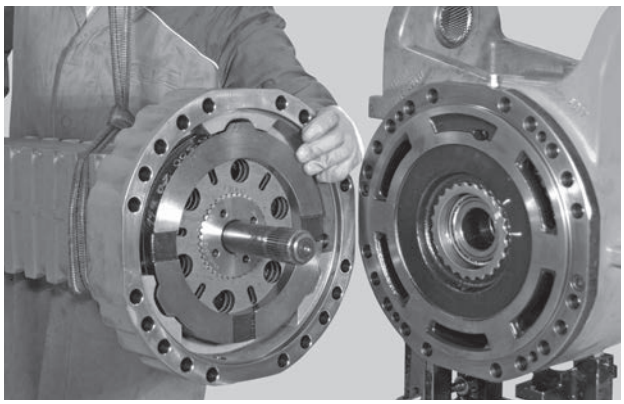


FIGURE 3: Remove arm together with brakes and axle shafts; set the arm in a vertical position using suitable brackets to keep it locked in place.
Release pressure.

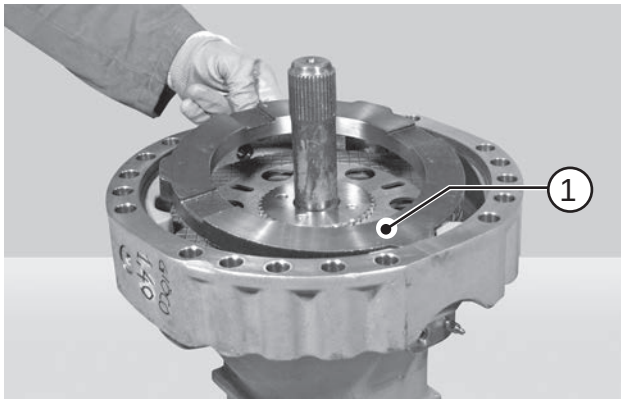


FIGURE 4: Write down the order of assembly and remove the end plate (1).

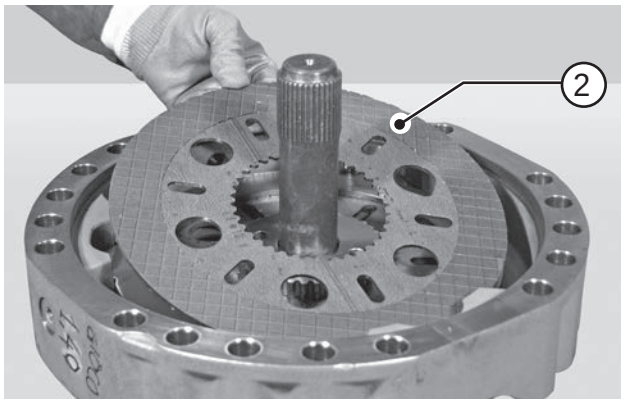


FIGURE 5: Remove braking discs (2, 3), noting down direction of assembly.

NOTE:

If disks are not to be replaced, avoid changing their position.

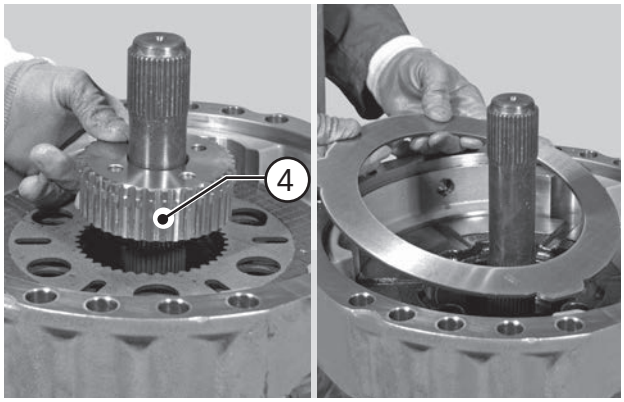


FIGURE 6: Remove the flange (4) complete with the discs. Noting down direction of assembly.

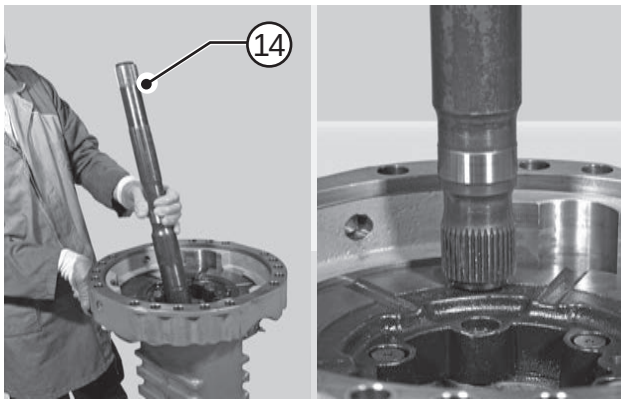


FIGURE 7: Remove the axle shaft.

NOTE:

Be very careful not to damage the seal ring.

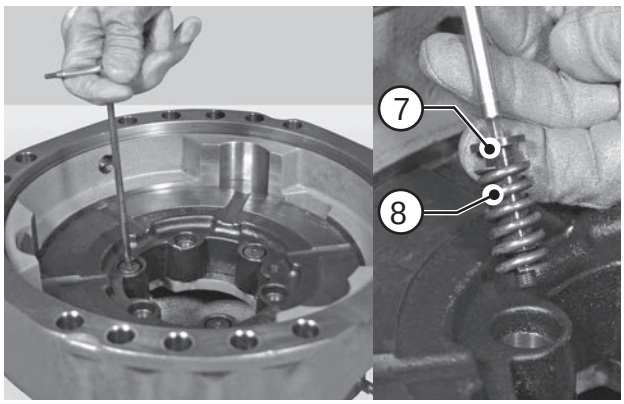


FIGURE 8: Remove the reversal springs (8) and screws (7).

NOTE:

If the springs (8) are weak or deformed they must be replaced.

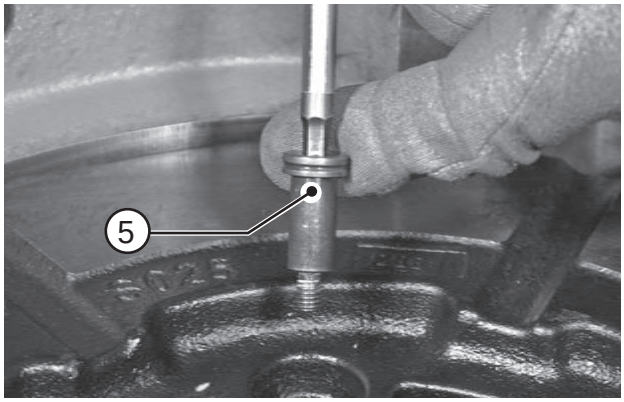


FIGURE 9: Remove the adjusting screws (5).

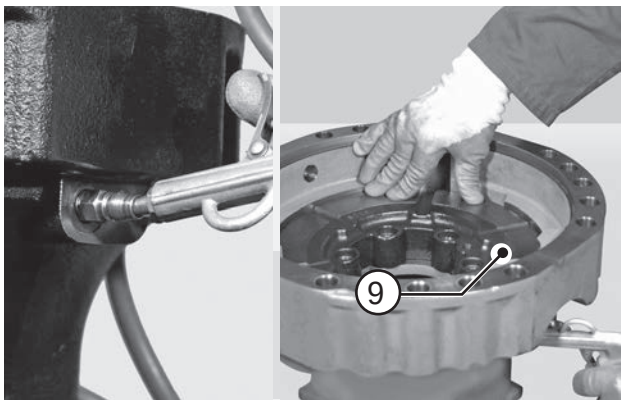


FIGURE 10: Slowly introduce low-pressure compressed air through the connection member for the service brake, in order to extract the piston (9).

⚠CAUTION

Hold the piston (9) back, as it may be suddenly ejected and damaged.

ASSEMBLY

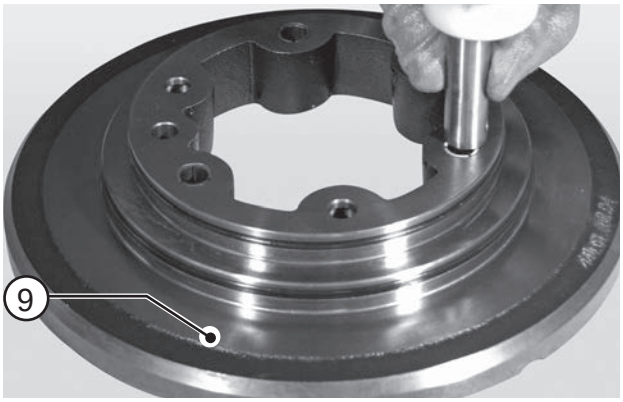
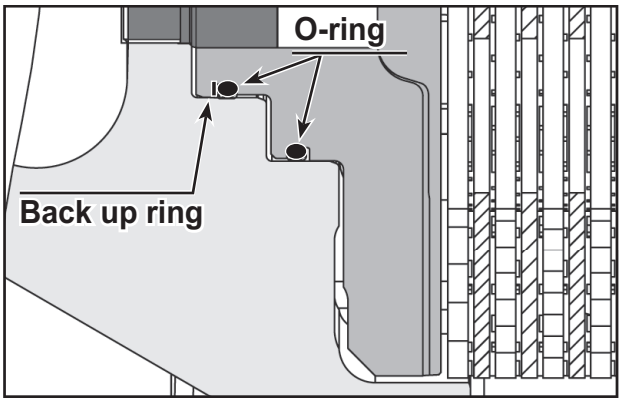


FIGURE 11: Insert the stroke automatic regulation springs (6); place them in line with the piston (9).

FIGURE 12: Fit o-ring (11, 12) and back-up ring (10, 13) onto the piston (11).
Lubricate the piston and the o-rings and install the unit into the arm.



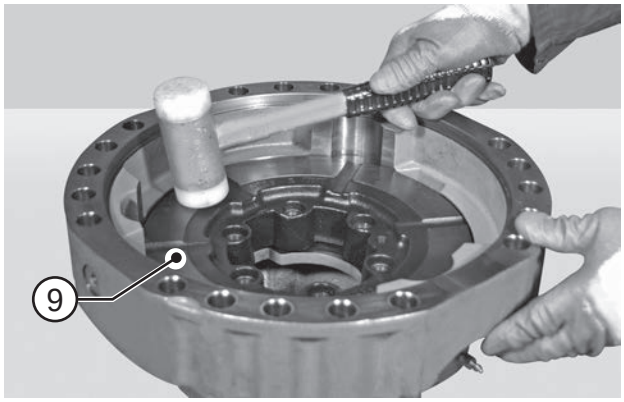


FIGURE 13: Using a plastic hammer, install the piston (9) into the arm.

NOTE:

Lightly hammer all around the edge in an alternate sequence.

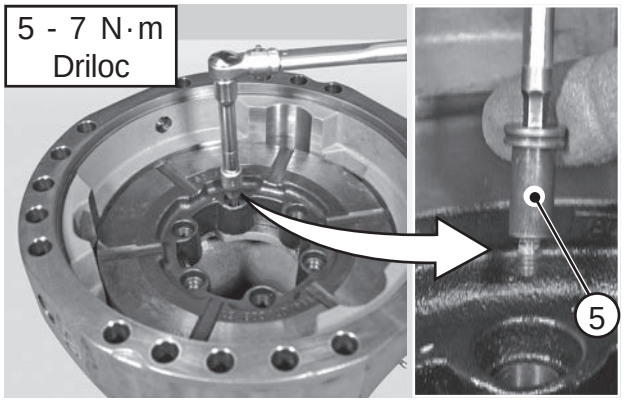


FIGURE 14: Fit the adjusting screws (5).
Torque wrench setting: 5 -7 N·m.

⚠CAUTION

Use only new screws pre-treated with Driloc locking adhesive. Threads must be cleaned from oil.

Degrease only non pre-treated threads.

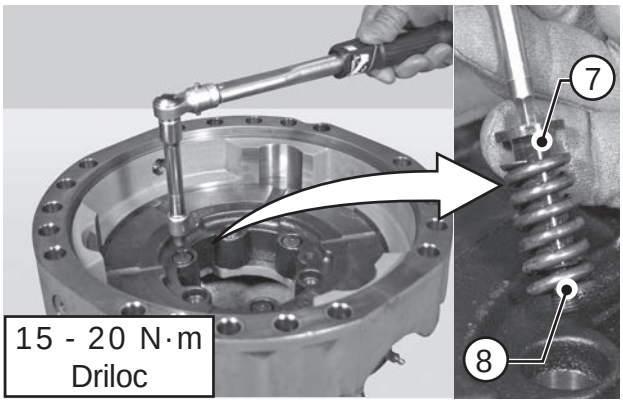


FIGURE 15: Fit the reversal springs (8) on the piston (9). Tighten with torque wrench setting of 15 - 20 N·m

⚠CAUTION

Use only new screws pre-treated with Driloc locking adhesive. Threads must be cleaned from oil.

Degrease only non pre-treated threads.

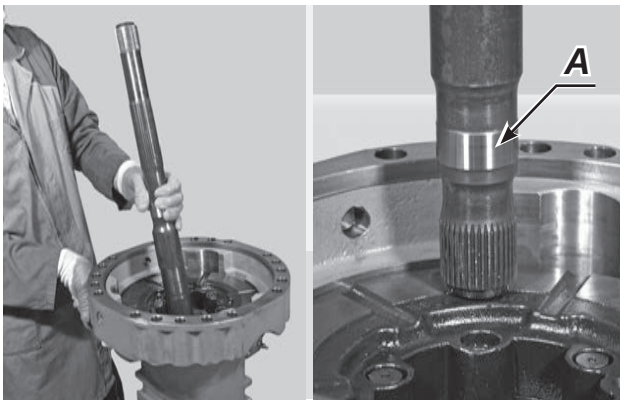


FIGURE 16: Grease sealing face “A” of axle shaft .

NOTE:

Be very careful not to damage the snap ring .

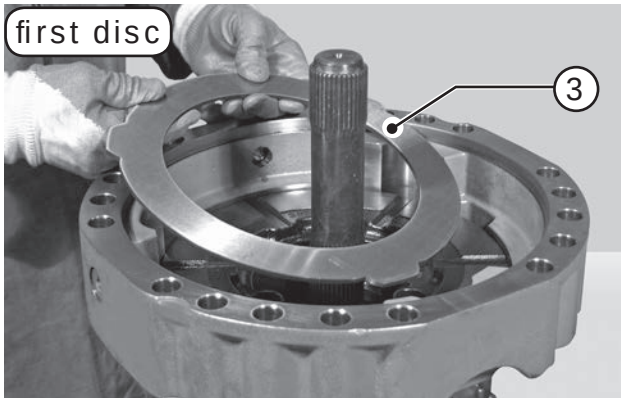


FIGURE 17: Insert the brake discs in the right sequence.

NOTE:

The first brake disc (3) to be inserted must be of steel material.

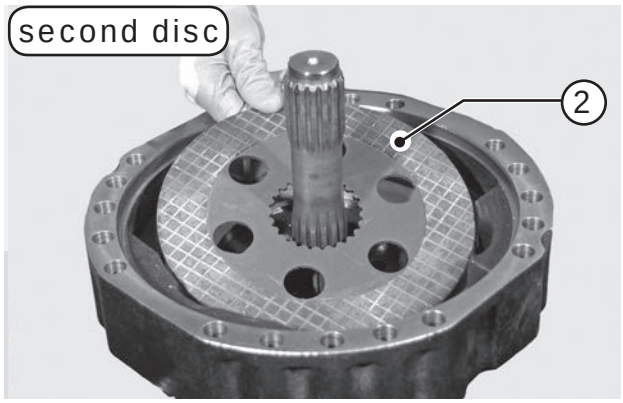


FIGURE 18: The second brake disc (2) to be inserted must be of friction material.

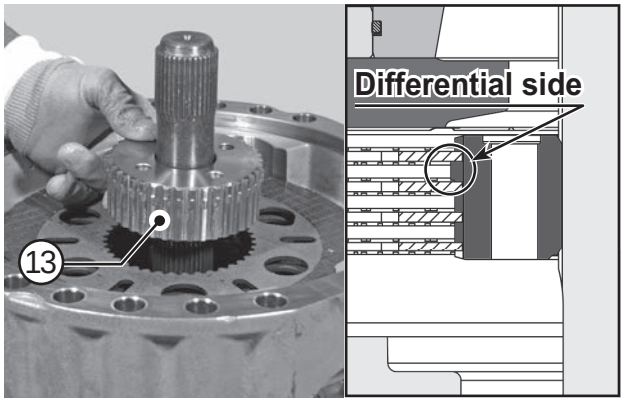


FIGURE 19: Install the flange (4) on the arm.

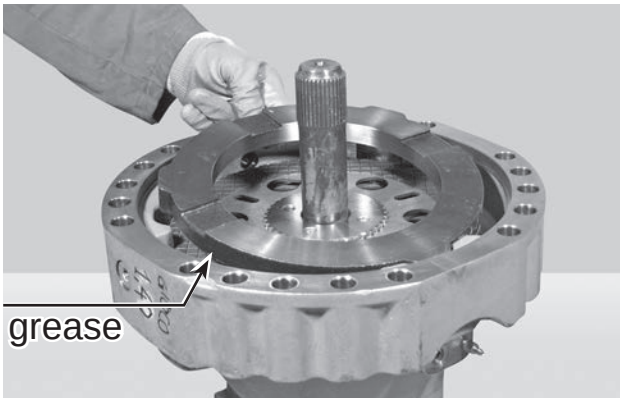


FIGURE 20: Insert the end plate (1). Before installing the last brake disc and the end plate (1), spread grease over the contact surfaces to hold them in position while mounting on the central housing.

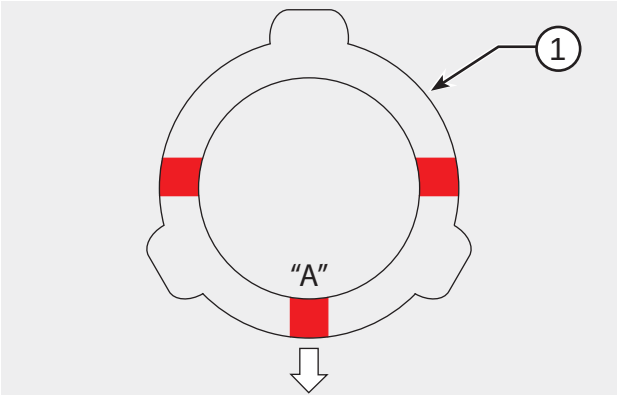


FIGURE 21: Install the end plate (1) with the oil passage notch "A" facing downwards.

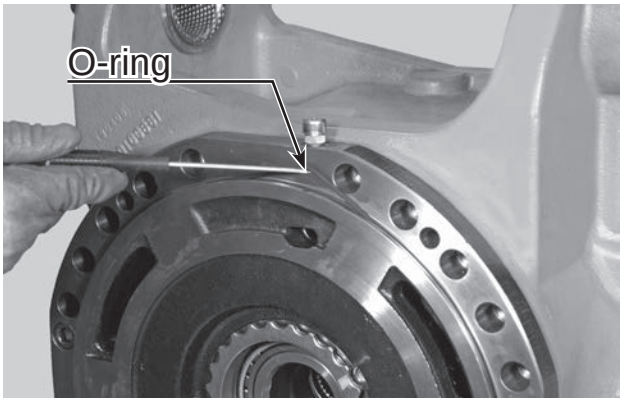


FIGURE 22: Install the new o-ring. Lubricate before installing.

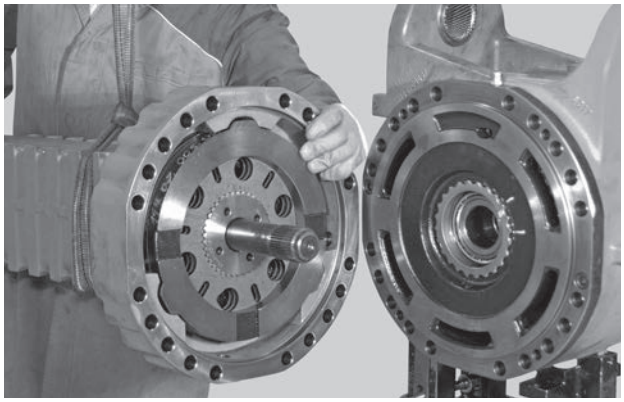


FIGURE 23: The arm was attached to a sling during dismantling.
The approximate weight of the arm complete with brakes and planetary reduction gear is 351 kg (774 lb).
Check condition and position of the arm's o-ring; install the complete arm.

NOTE:

To assist axle shaft centering, slightly move the wheel hub.

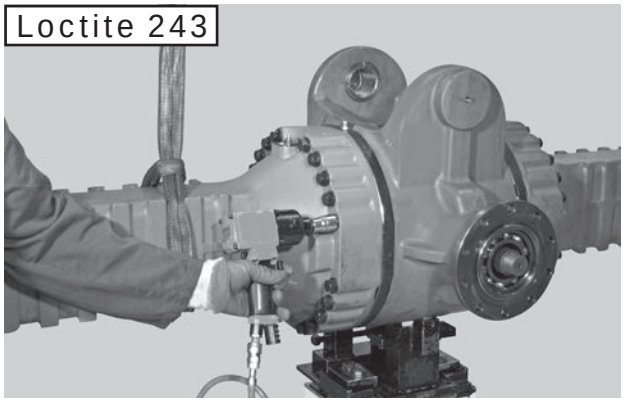


FIGURE 24: Temporarily lock the arm with nuts previously coated with Loctite 243; tighten lightly to make the unit touch the main body.

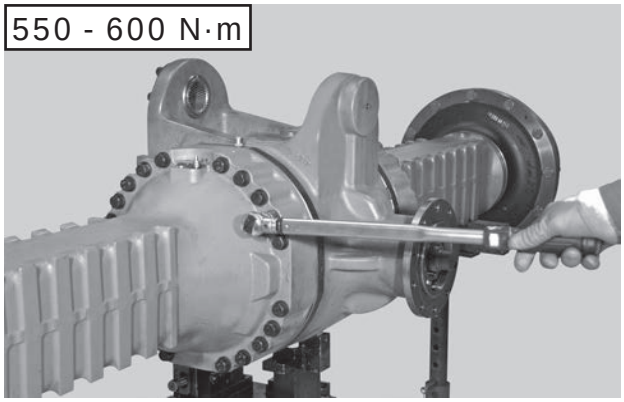
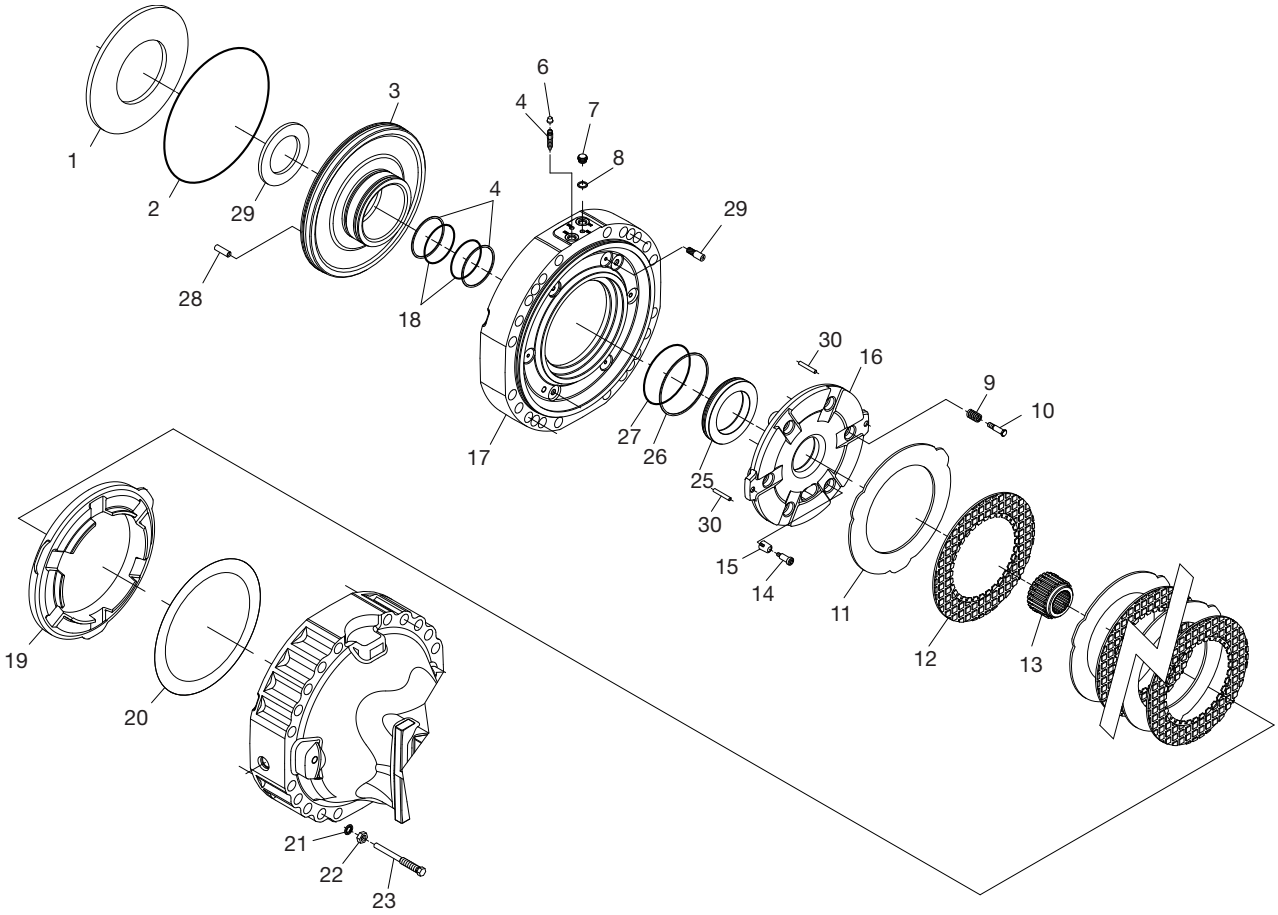


FIGURE 25: Secure in position with the screws (3) tightening to a torque of 550 - 600 N·m.

SERVICE BRAKE AND NEGATIVE PARKING BRAKE

EXPLODED VIEW



RELEASE

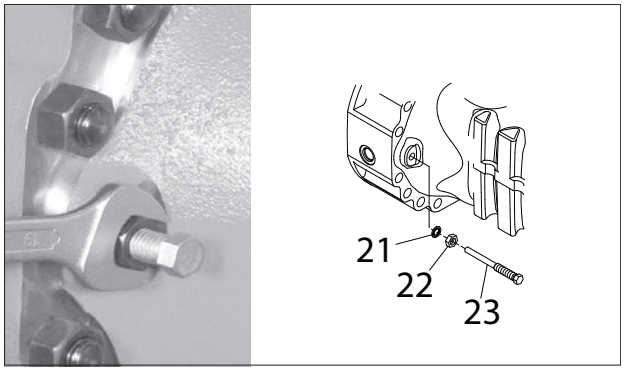


FIGURE 1: Loosen nuts (22) of screws (23) provided for the mechanical and manual release of the braking units, then move the nuts backwards by approximately 8 mm.

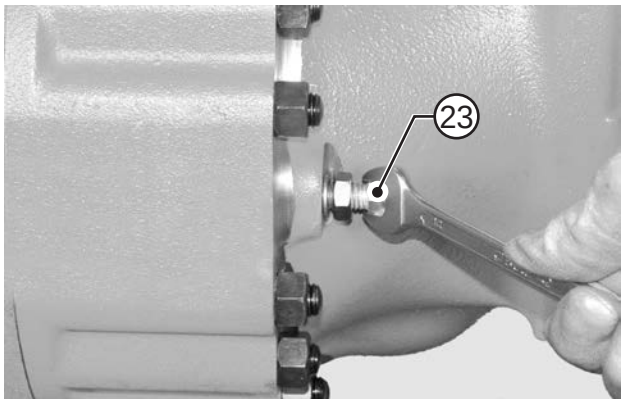


FIGURE 2: Tighten screws (23) to fasten the pressure plate (16).

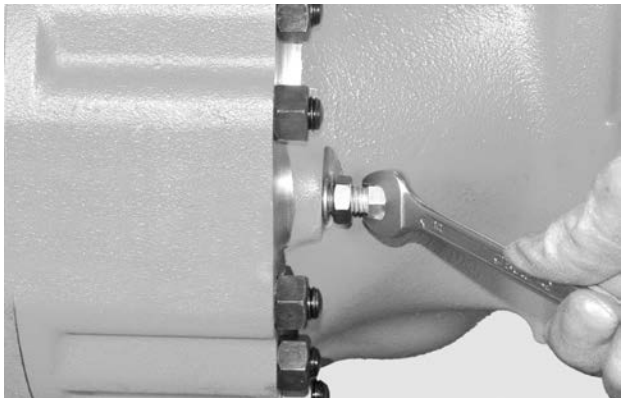


FIGURE 3: Using a wrench, tighten the screws (23) in an alternate sequence by 1/4 turn at a time so as to compress the Belleville washers (1) and disengage the braking disks.

⚠CAUTION

Tighten maximum by one turn.

ADJUSTMENT

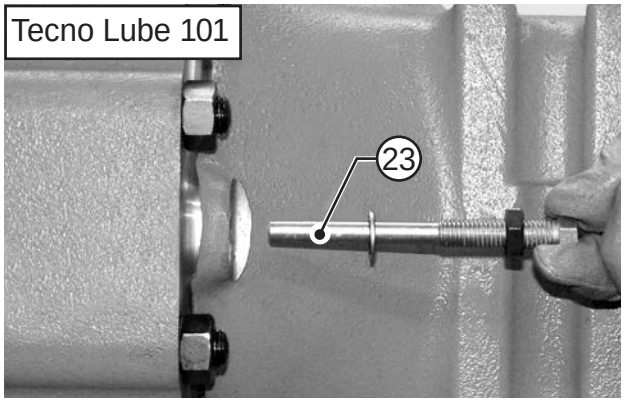


FIGURE 4: Remove screws complete with nuts and seals. Replace seals, apply silicone-based Tecno Lube /101 grease to the screws and install all parts into the arm.

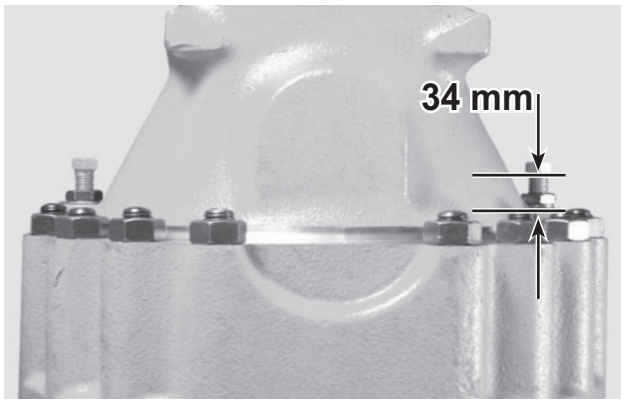


FIGURE 5: Adjust screws (23) to obtain a distance of 34 mm in relation to the arm.

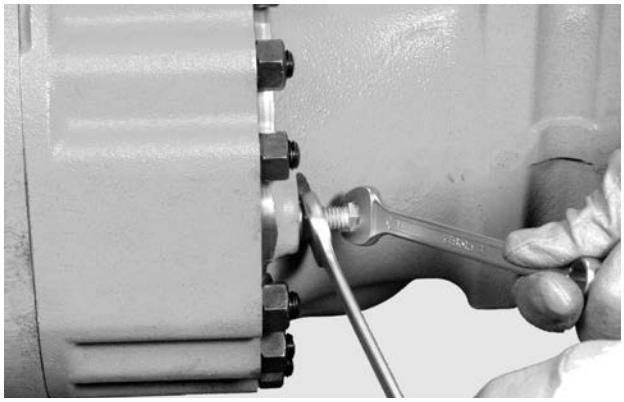


FIGURE 6: Lock into position with nuts (22).

⚠CAUTION

Hold screws (23) into position while locking the nuts (22); after locking, check the distance of screws (23) once more.

DISASSEMBLY

⚠DANGER

Before maintaining brakes, when the axle is installed on the vehicle, follow all safety instructions in the Original Equipment Manufacturer (OEM) manual that came with the vehicle.

⚠CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 13.

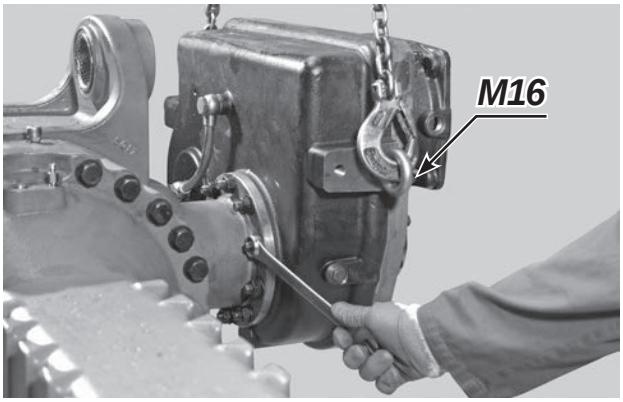


FIGURE 7: Insert and tighten two double joint lifting eyes size M16. Connect to suitable lifting gear and tighten. The approximate weight of the unit is 150 kg (331 lb).
Remove fastening screws from the reduction unit.

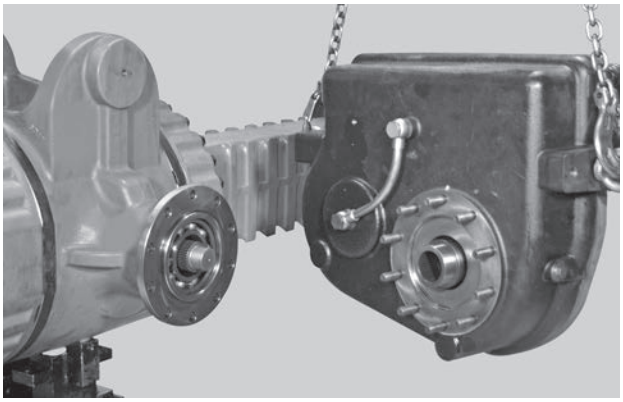


FIGURE 8: Disjoin the entire reduction unit from the axle and place it on a bench.

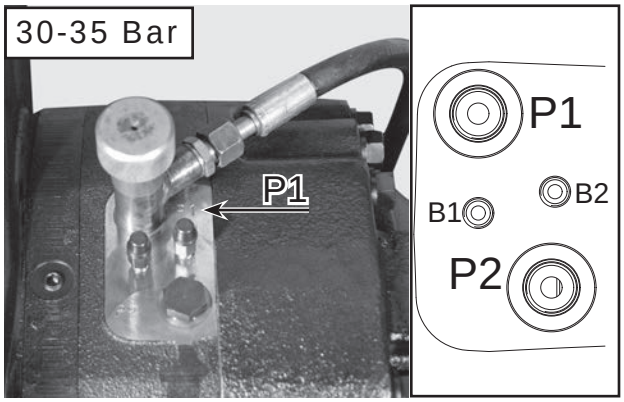


FIGURE 9: Connect an external pump to the union piece “P1“ of the negative brake and introduce a pressure of 30 - 35 bar to eliminate the pressure of the Belleville washers (1).

⚠DANGER

Always check that the hydraulic circuit test for leaks under pressure. Always use a cardboard or a panel to control the loss.

A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.

NOTE:

Perform all operations on both arms. Remove the oil plug "A" and drain oil.

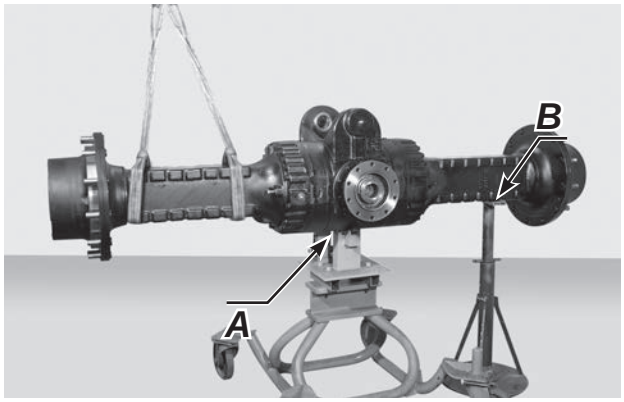


FIGURE 10: If axle is positioned on an overhaul bench, place a safety anti-tilting stand “B” under the arm that remains connected and block wheels, if any.

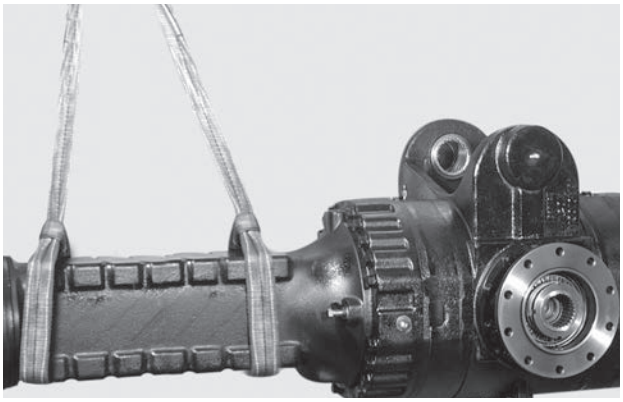


FIGURE 11: Attach a suitable sling to the arm, connect to lifting gear and tighten. The approximate weight of the arm complete with brakes and planetary gears is 351 kg (774 lb).

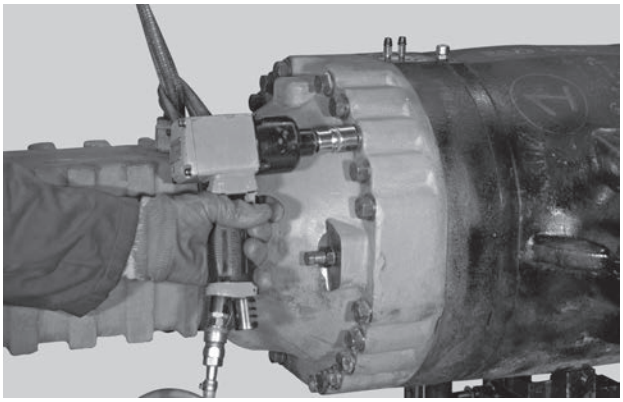


FIGURE 12: Remove the retainer screws.

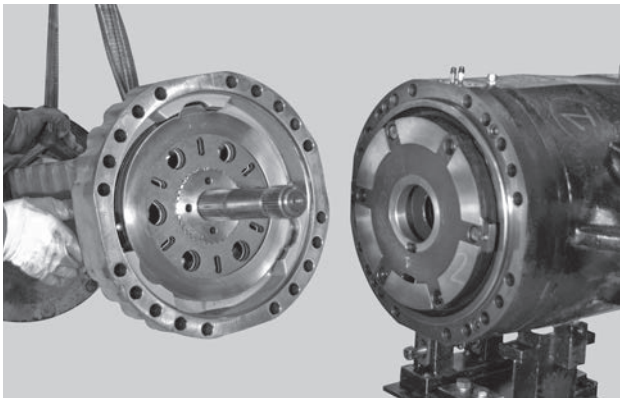


FIGURE 13: Remove arm together with brakes and axle shafts. Set the arm in a vertical position using suitable brackets to keep it locked in a safe condition.

FIGURE 14: Gradually release the pressure in the braking circuit, bringing it to zero through the external pump.

⚠DANGER

Do not remove any part of the hydraulic circuit without having completely released the hydraulic pressure.

The removal of pressurized parts or loss caused from releasing these components can cause serious injuries and even death. A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.

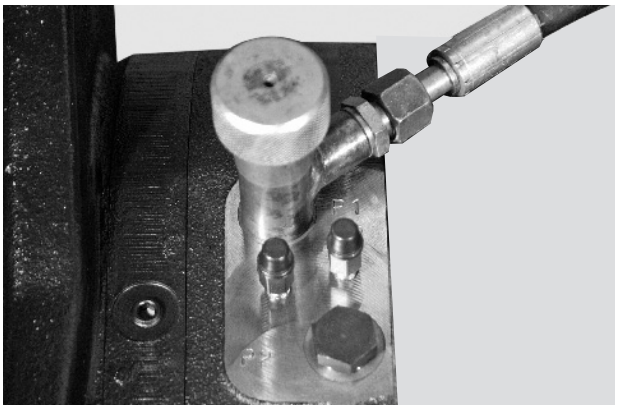


FIGURE 15: Gradually loosen the sleeve and remove.

⚠DANGER

Carefully check that the hydraulic pressure is discharged completely before removing the external pump sleeve connected to the brake.

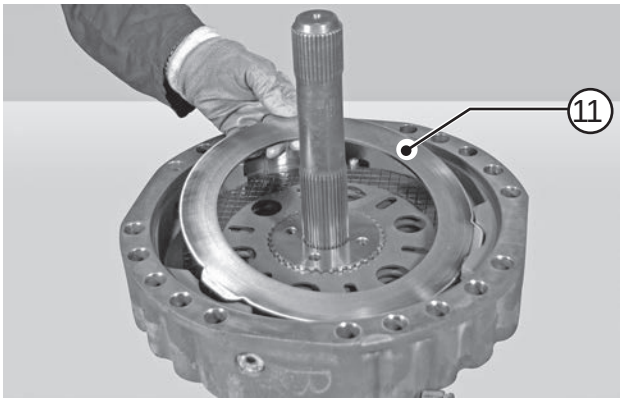


FIGURE 16: Remove braking discs (11, 12), noting direction of assembly.

NOTE:

If disks are not to be replaced, avoid changing their position.

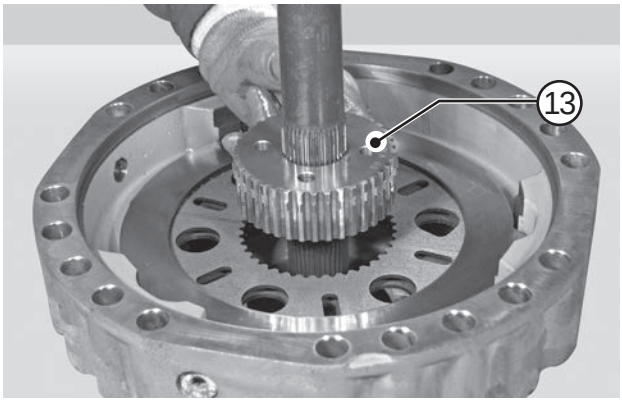


FIGURE 17: Remove the flange (13) complete with the discs, noting direction of assembly.

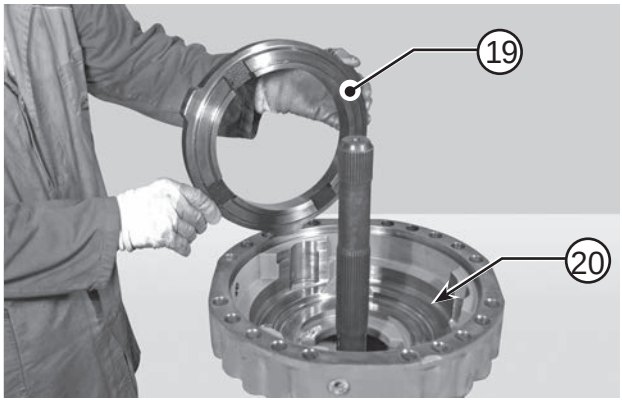


FIGURE 18: Remove spacer braking discs (19) and shims (20), noting direction of assembly.

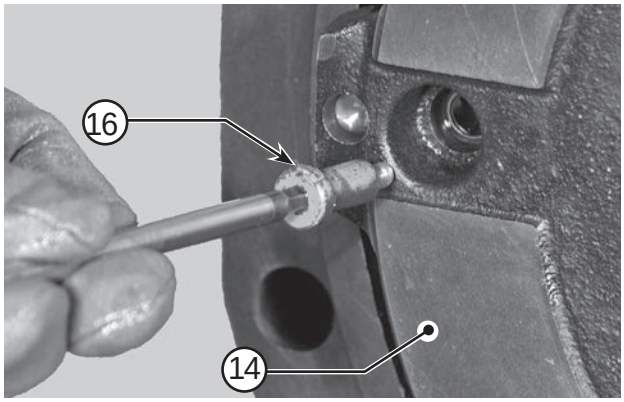


FIGURE 19: Remove the adjusting screws (14) from the counterwasher (16).

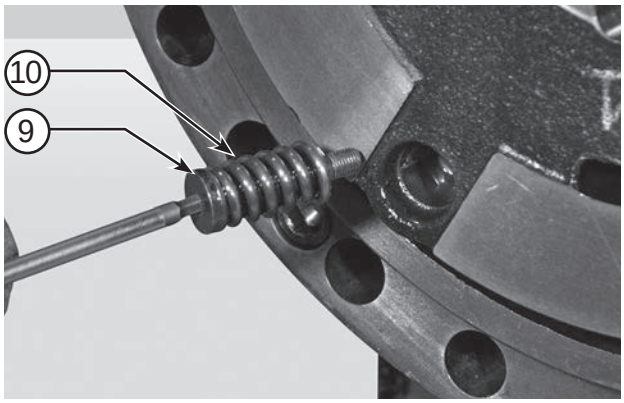


FIGURE 20: Remove the reversal springs (9) and screws (10).

NOTE:

If the springs (9) are weak or deformed they must be replaced.

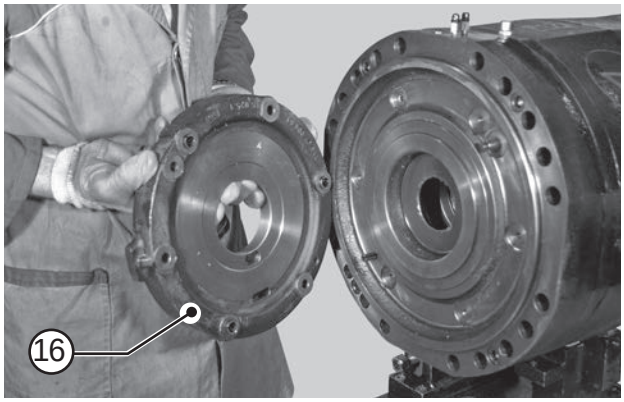


FIGURE 21: Write down the order of assembly and remove the counterwasher (16).

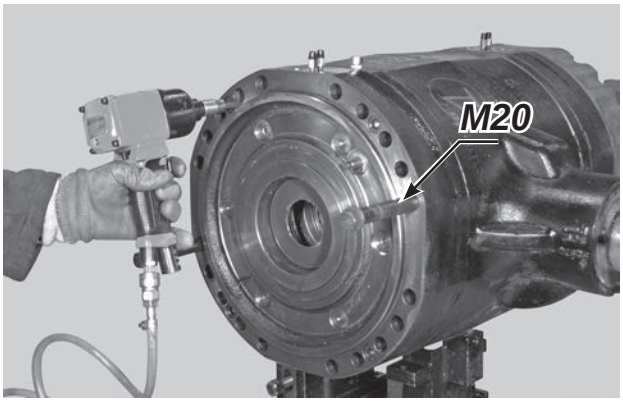


FIGURE 22: Tighten two safety M20 studs in the main body. Loosen the capscrews (29) using the criss-cross method and remove them.

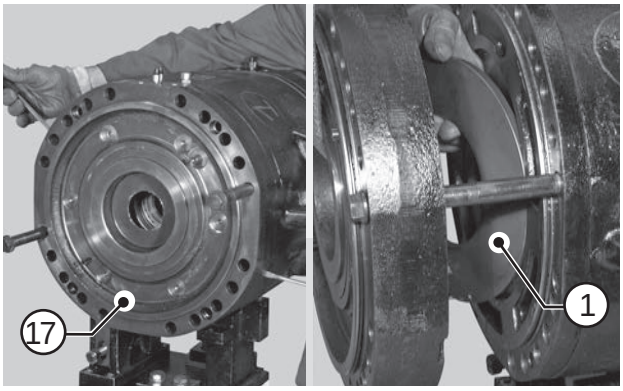


FIGURE 23: Move the cover (17) outwards while supporting the Belleville washers (1). Remove the Belleville washers (1) and write down direction of assembly.

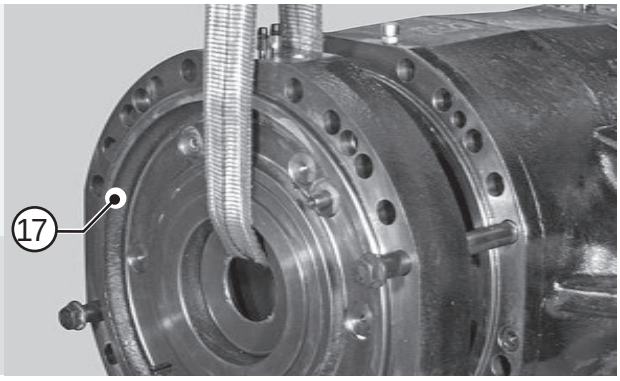


FIGURE 24: Attach a suitable sling to the brake cover, connect to lifting gear, and tighten. The approximate weight of the brake cover is 45kg (99lb). Remove the studs. Remove the brake cover (17).

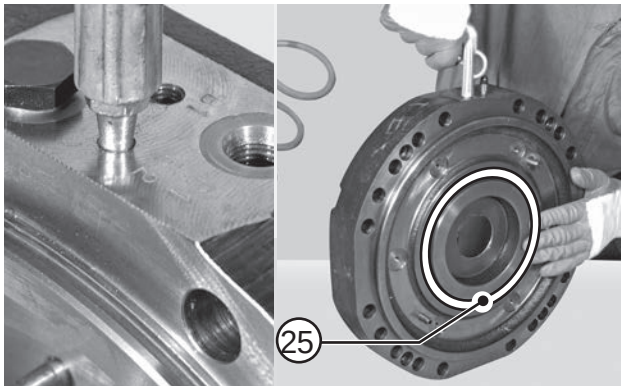


FIGURE 25: Slowly introduce low-pressure compressed air through the connection member for the service brake (P2), in order to extract the piston (25).

⚠CAUTION

Hold the piston (25) back, as it may be suddenly ejected and damaged.

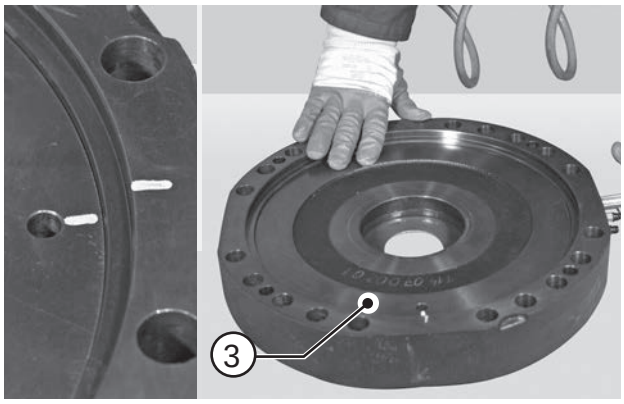
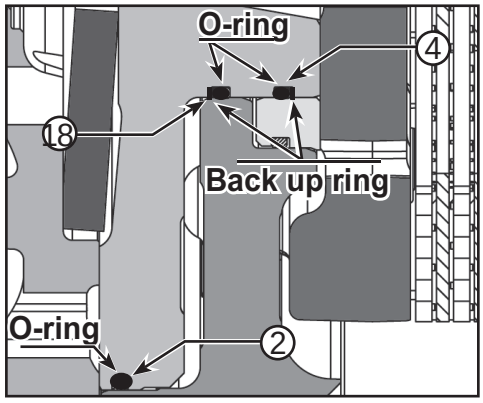


FIGURE 26: Slowly introduce low-pressure compressed air through the connection member for the negative brake (P1), in order to extract the piston (3).

⚠CAUTION

Hold the piston (3) back, as it may be suddenly ejected and damaged. Write down the order of assembly.

ASSEMBLY



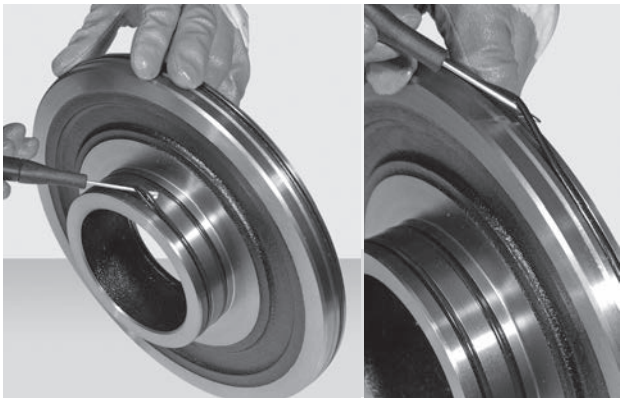


FIGURE 27: Fit o-ring (2) and (4) and anti-extrusion ring (18) onto the piston (3).

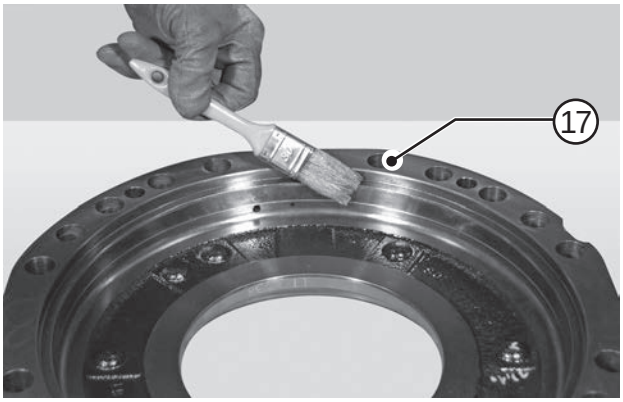


FIGURE 28: Check the position of the anti-extrusion (18) and o-rings (2) and (4).
Lubricate the piston and the o-rings and install the unit (3) into the cylinder (17) .

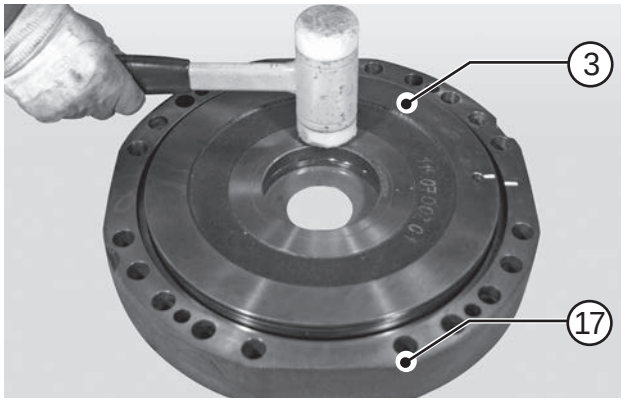


FIGURE 29: Using a plastic hammer, install the piston (3) into the cylinder (17).

NOTE:

Lightly hammer all around the edge in an alternate sequence.

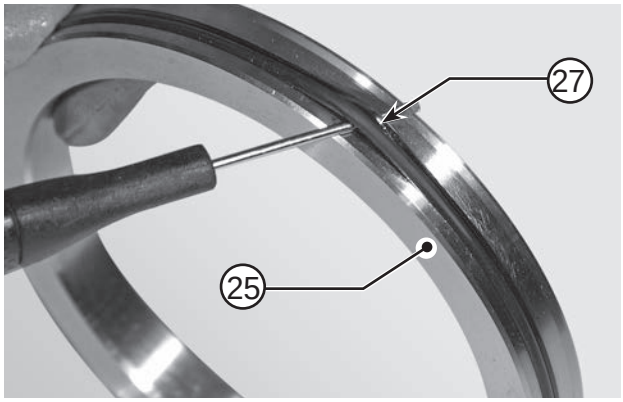


FIGURE 30: Fit o-ring (27) and anti-extrusion ring (26) onto the piston (25).

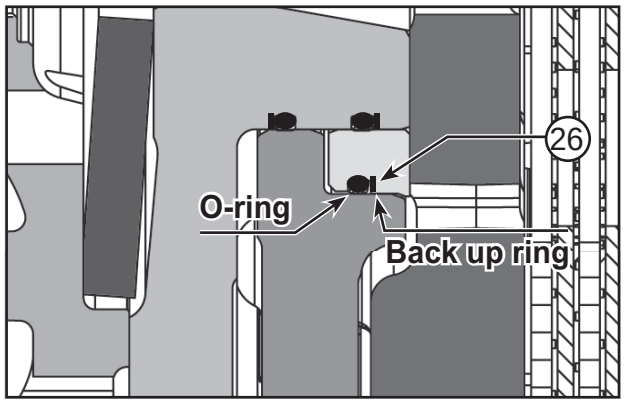


FIGURE 31: The o-rings always have to be assembled from the pressure facing side.

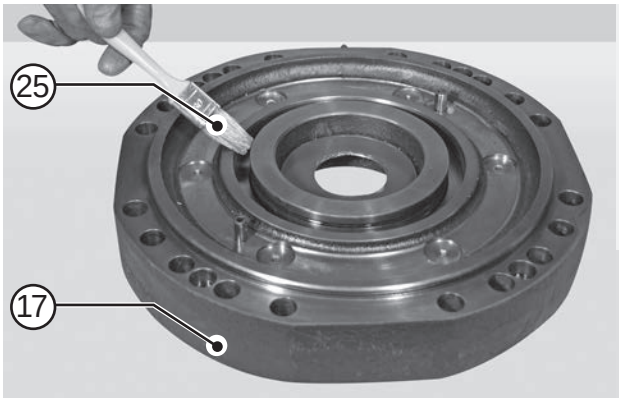


FIGURE 32: Lubricate the piston and the o-rings and install the unit (25) into the cover (17) .

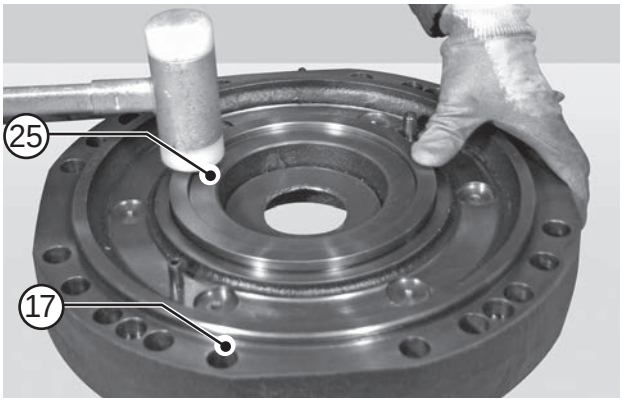


FIGURE 33: Using a plastic hammer, install the piston (25) into the cover (17).

NOTE:

Lightly hammer all around the edge in an alternate sequence

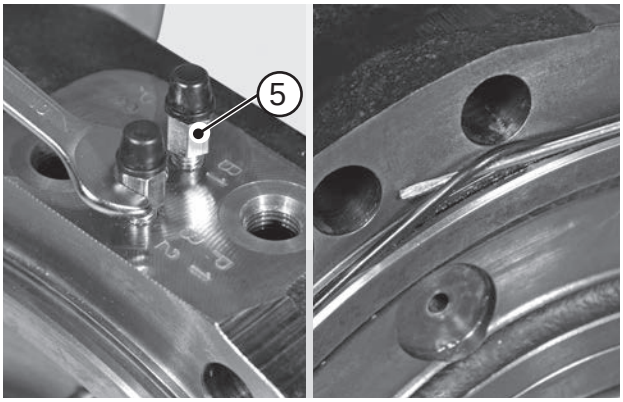


FIGURE 34: Assemble the bleed valve (5) and the new o-ring. Grease before installing.

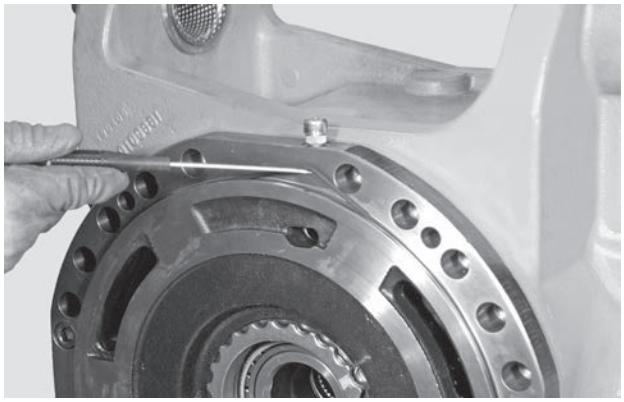


FIGURE 35: Install the new o-ring.
Grease before installing.

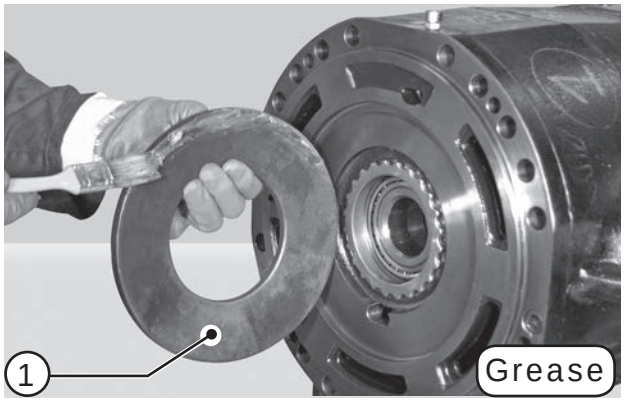


FIGURE 36: Position the Belleville washers (1) and engage the cylinder. Spread grease over the contact surfaces to hold them in position.

NOTE:

Check the direction of Belleville washers (1) and relative centering.

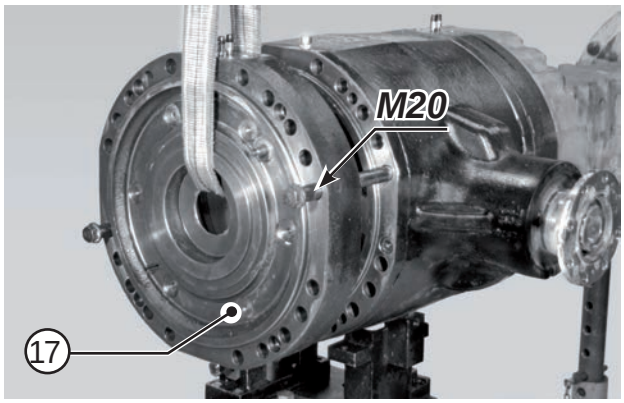


FIGURE 37: Connect a suitable sling to the satellite carrier cover, connect to lifting gear and tighten. The approximate weight of the cover is 67kg (148lb).
Tighten two safety M20 studs in the main body.
Engage the cover (17).

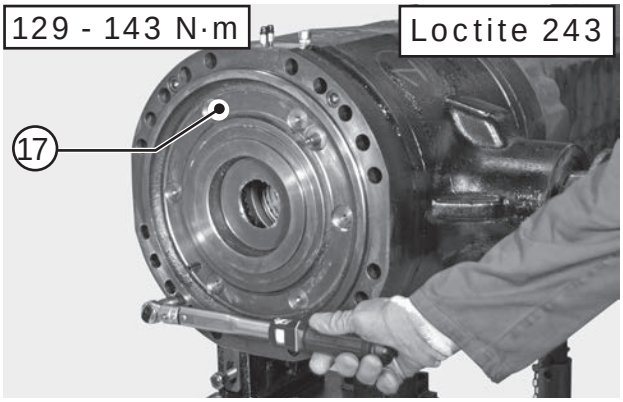


FIGURE 38: Insert the screws (29) and tighten them alternately. Tightening the screws (29) to a torque of 129 - 143 N·m. Remove the studs.

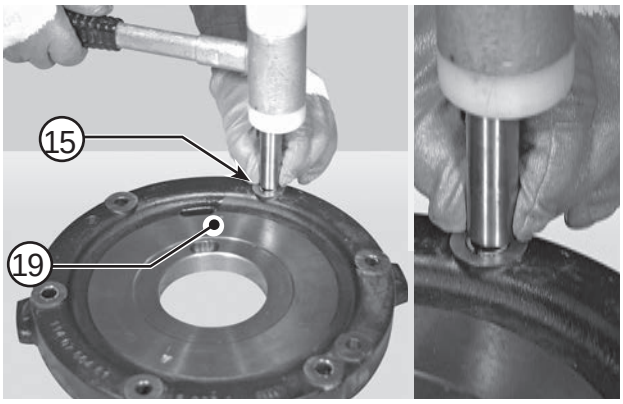


FIGURE 39: Insert the stroke automatic regulation springs (15); place them in line with the intermediate disc (19).

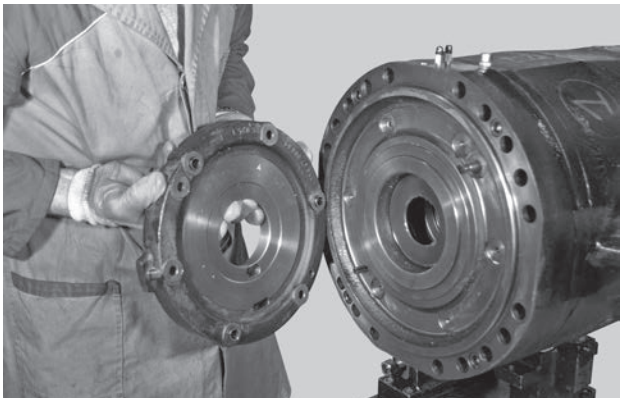


FIGURE 40: Insert the intermediate disc (19).

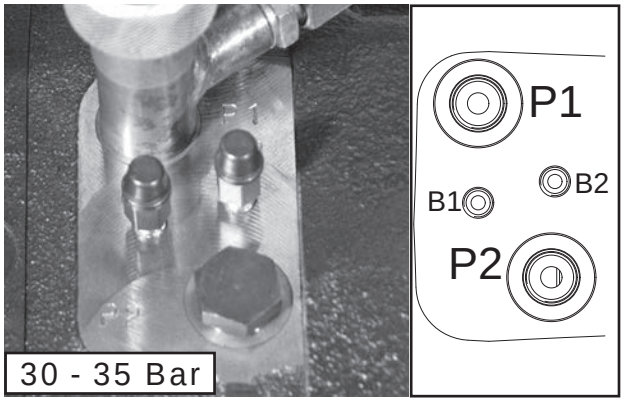


FIGURE 41: Connect an external pump to the negative brake (P1) and introduce pressure to 30 -35 bar.

⚠DANGER

Always check that the hydraulic circuit test for leaks under pressure. Always use a cardboard or a panel to control the loss.

A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.

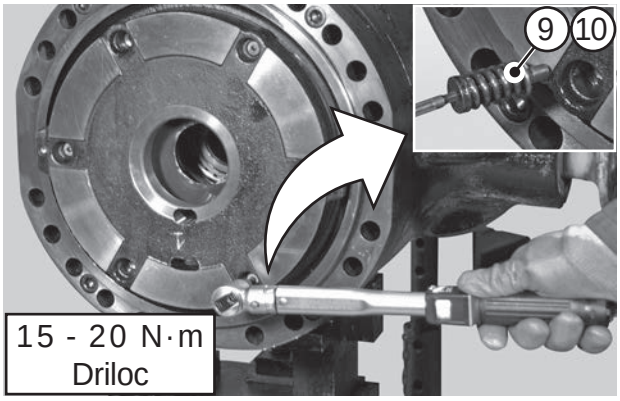


FIGURE 42: Fit the reversal springs (9) and screws (10) on the intermediate disk (16).
Tighten with torque wrench setting of 15 -20 N·m

⚠CAUTION

Use only new screws pre-treated with Driloc locking adhesive. Threads must be cleaned from oil.

Degrease only non pre-treated threads.

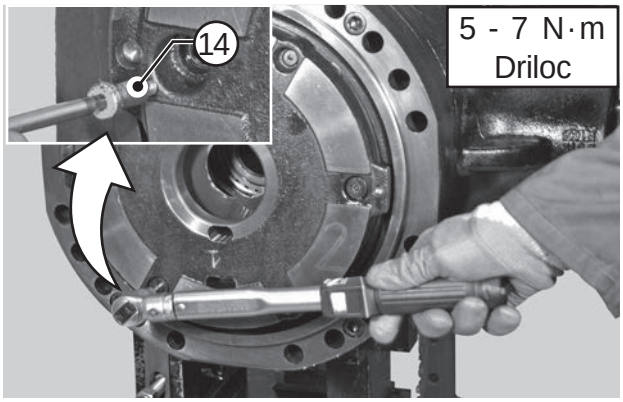


FIGURE 43: Install the adjusting screws (14) on the threads and tighten to 5-7 N·m.

⚠CAUTION

Use only new screws pre-treated with Driloc locking adhesive. Threads must be cleaned from oil.

Degrease only non pre-treated threads.

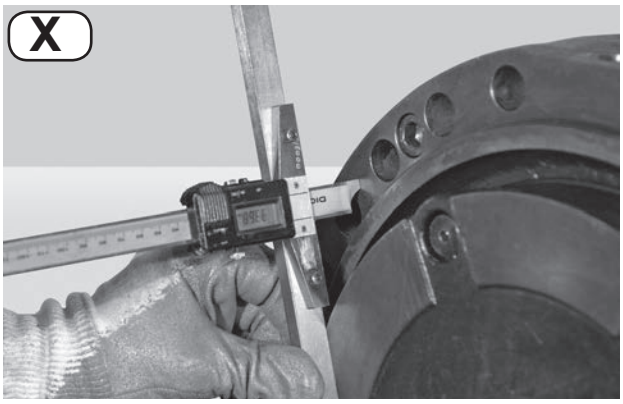


FIGURE 44: Take the measurement “X” from the surface of the intermediate disk to the cover sealing surface with 30 - 35 bar of pressure introduced.
EXAMPLE: X = 30.2 mm

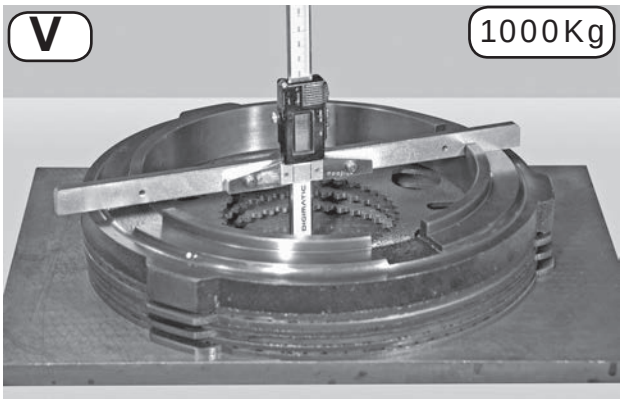


FIGURE 45: Put the brake disc pack including the shim under a press, load with 1000 kg and take the measure “V”.
EXAMPLE: V = 57.5 mm

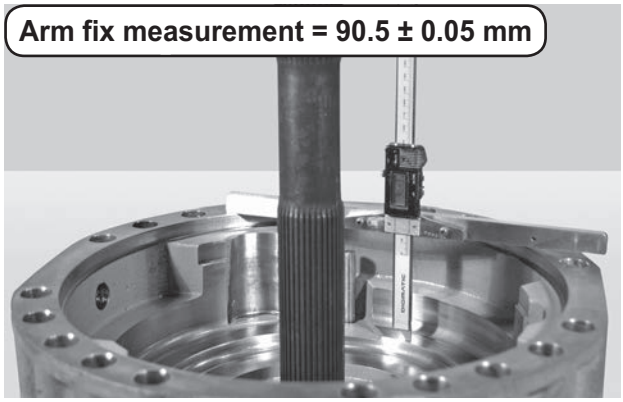


FIGURE 46: Arm fix measurement = 90.5 - 0.05 mm

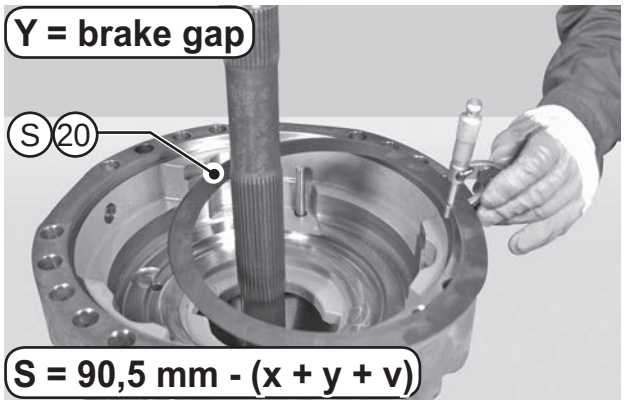


FIGURE 47: Y = 1.5 mm = brake gap
S = 90.5 mm - (x + y + v) = Thickness of shims to insert under the shim washer.
Tolerance = - 0.1 mm
EXAMPLE: 90.5 mm - (30.2 + 57.5 + 1.50) = S = 1.30 mm

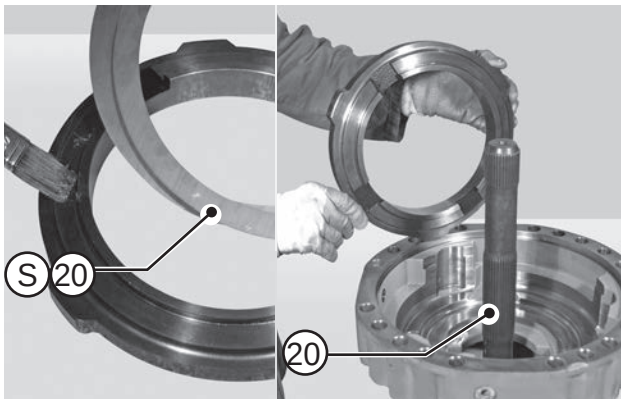


FIGURE 48: Grease the shims S (20) and assemble in position on the spacer braking disc (19), then insert them in the arm.

NOTE:

Make sure the shims are inserted correctly.

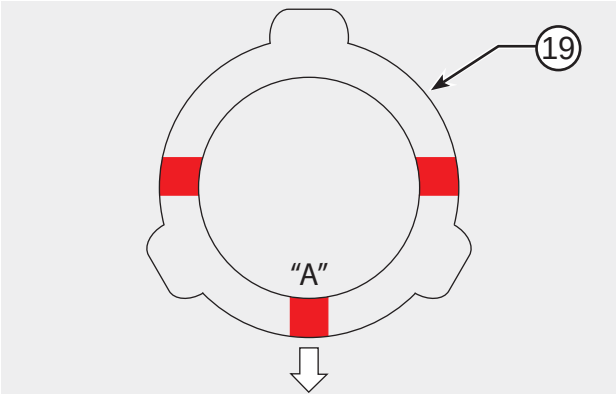


FIGURE 49: Install the spacer braking disc (19) with the oil passage notch "A" facing downwards.

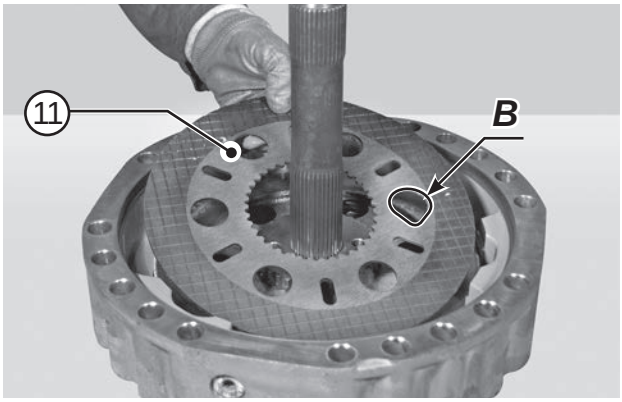


FIGURE 50: Slightly lubricate the braking disks (11, 12) and fit them in the arm following the correct sequence. Orient them so the oil circulation holes and the marks "B" are perfectly lined up.

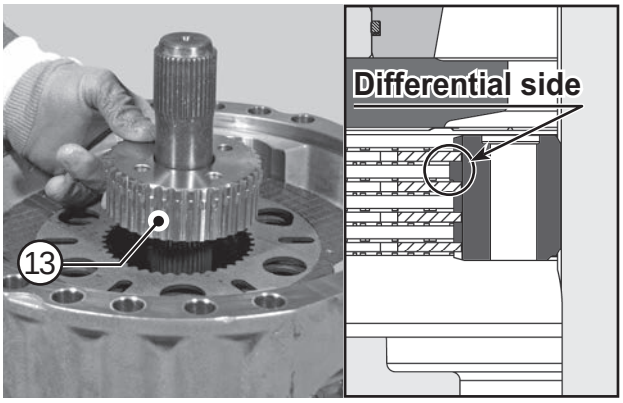


FIGURE 51: Install the flange (13) on the arm.

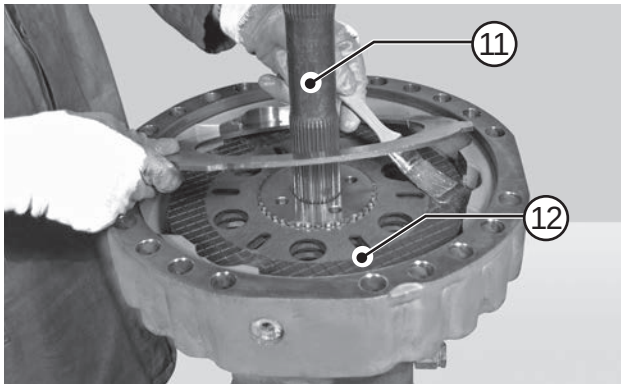


FIGURE 52: Insert the brake discs (11) and (12) in the right sequence. Spread grease over the contact surfaces to hold them in position while mounting on the central housing.

NOTE:

The last brake disc to be inserted must be of steel material.

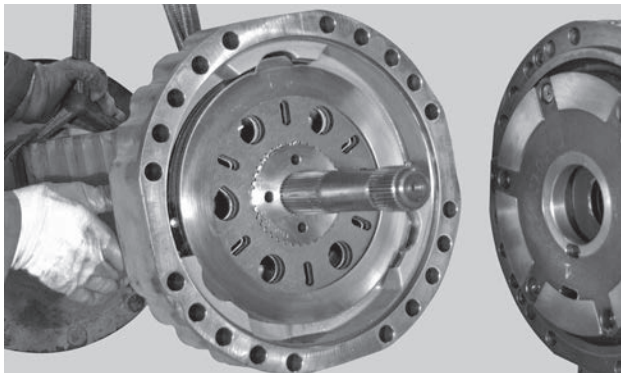


FIGURE 53: The arm was attached to a sling during dismantling.
The approximate weight of the arm complete with brakes and planetary reduction gear is 351 kg (774 lb).
Check condition and position of the arm's o-ring;
Install the complete arm.

NOTE:

To assist axle shaft centering, slightly move the wheel hub.

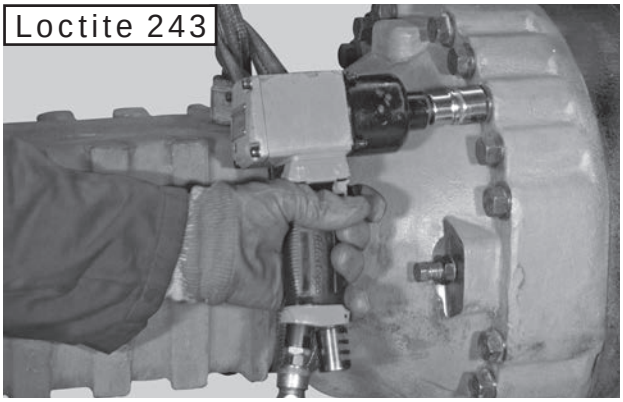


FIGURE 54: Temporarily lock the arm with nuts previously coated with Loctite 243; tighten lightly to make the unit touch the main body.

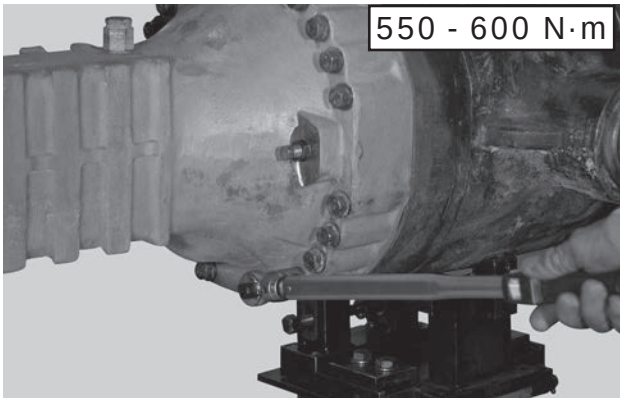


FIGURE 55: Secure in position with the screws (3) tightening to a torque of 550 - 600 N·m.

FIGURE 56: Gradually release the pressure in the braking circuit, bringing it to zero through the external pump.

⚠DANGER

Do not remove any part of the hydraulic circuit without having completely released the hydraulic pressure.

The removal of pressurized parts or loss caused from releasing these components can cause serious injuries and even death. A leak from a hole of the size of a pin can cause serious injury. If fluid is injected into the skin it is necessary to seek immediate medical care.

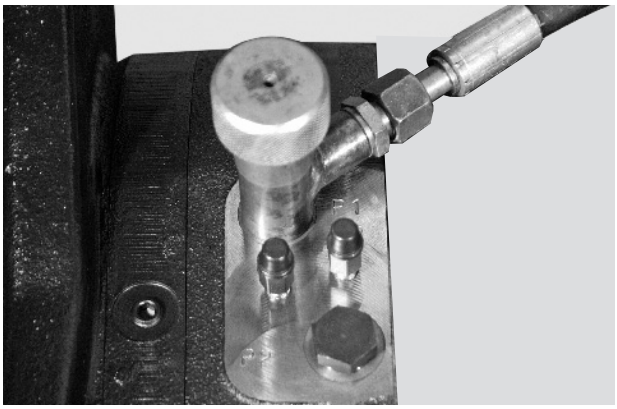


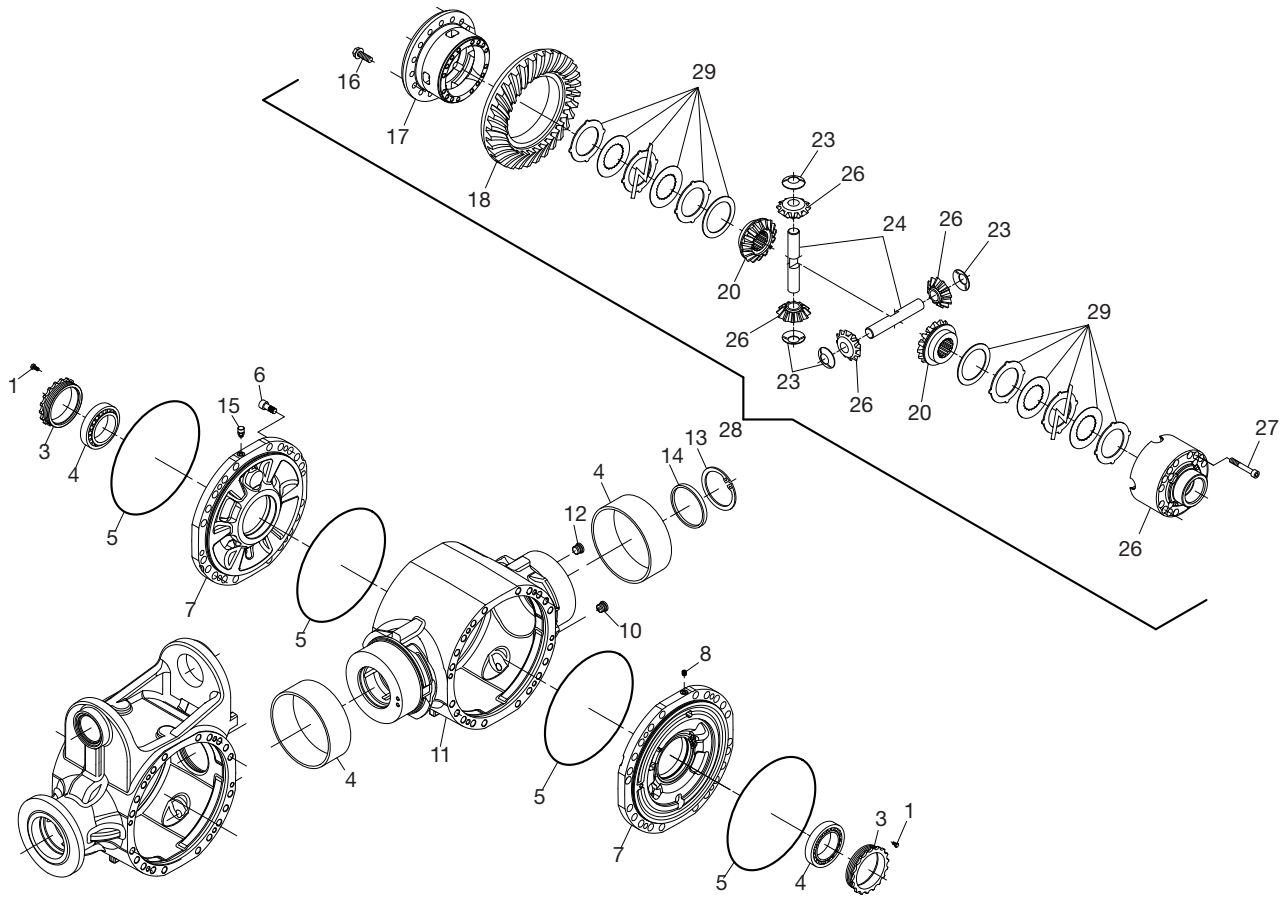
FIGURE 57: Gradually loosen the sleeve and remove.

⚠DANGER

Carefully check that the hydraulic pressure is discharged completely before removing the external pump sleeve connected to the brake.

DIFFERENTIAL

EXPLODED VIEW



DISASSEMBLY

⚠CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 13.

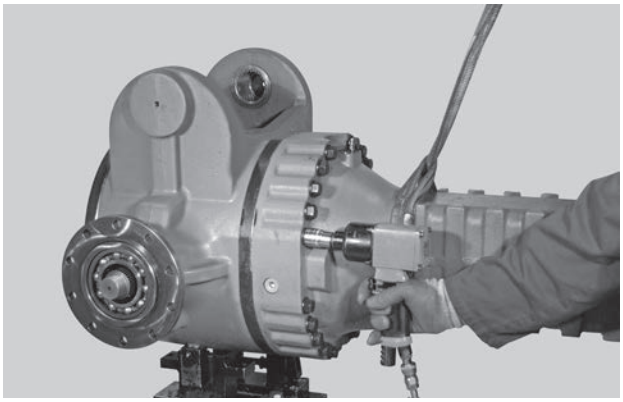


FIGURE 1: Attach a suitable sling to the arm, connect to lifting gear and tension. The approximate weight of the arm complete with brakes and planetary gears is 351 kg (774 lb).
Sling the arm to be removed and connect it to a hoist.
Remove the retainer screws and relative washers.
For details, see SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 39.

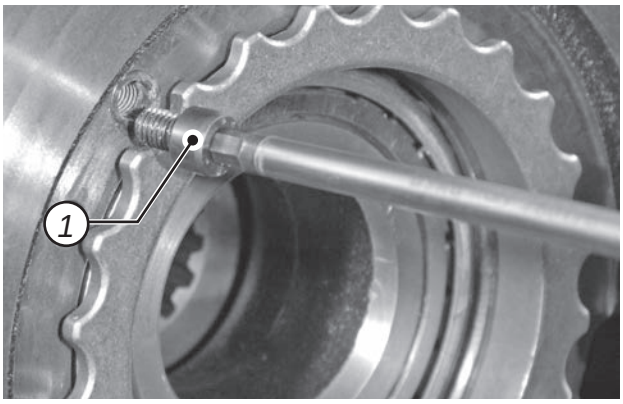


FIGURE 2: Only if needing removing or adjusting, mark the position of the ring nuts (1).
Remove the capscrews (3) from the ring nuts (1).

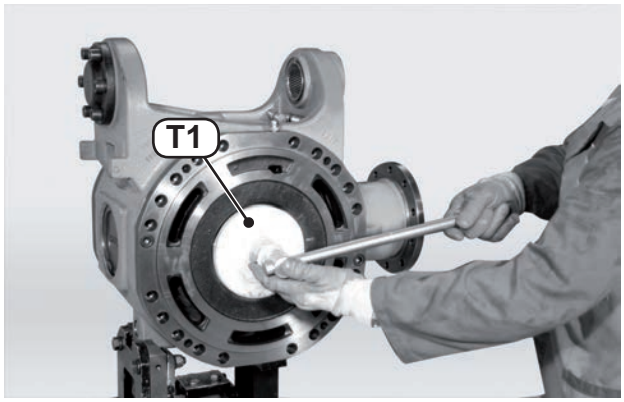


FIGURE 3: Only if needing removing or adjusting, uniformly heat the ring nuts (1) up to a temperature of 80° C.
Using tool T1, loosen and remove the ring nuts (3).

NOTE:

Accurately remove any trace of sealant from the threads of ring nuts and intermediate covers.

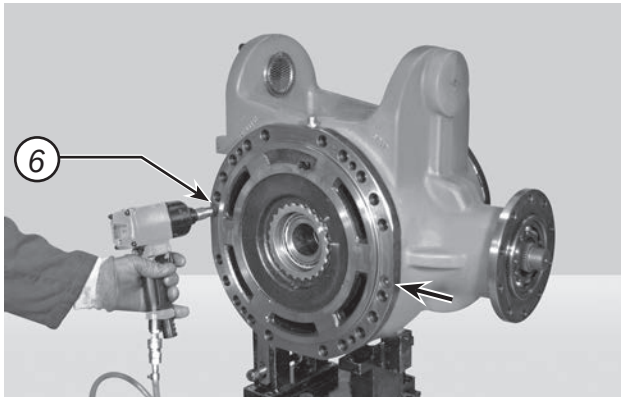


FIGURE 4: Tighten two safety M20 studs in the main body.
Loosen and remove the check screws (6) of intermediate cover (7) on ring gear side.

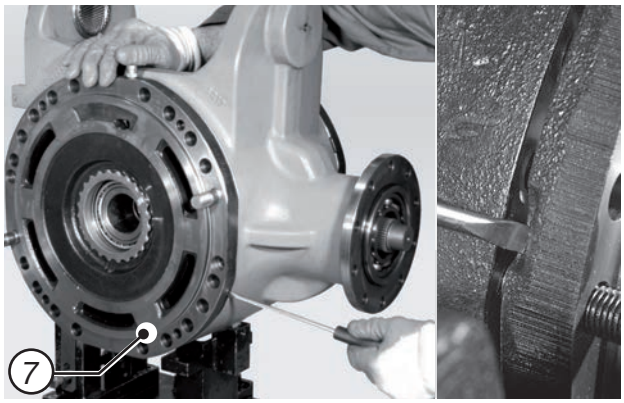


FIGURE 5: Disjoin the cover (7) ring gear side.

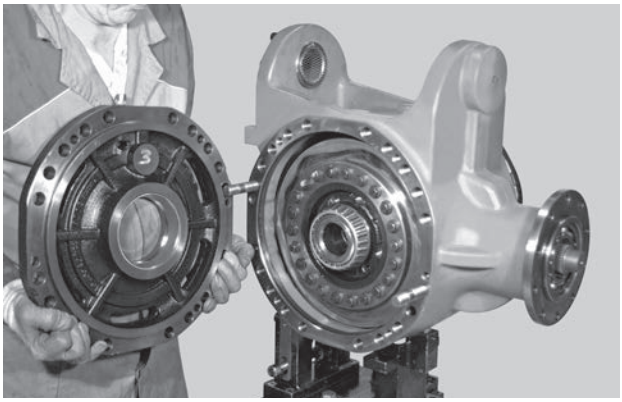


FIGURE 6: Remove the cover and studs.

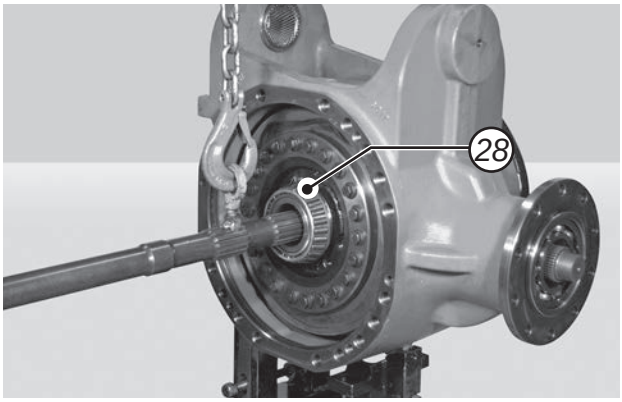


FIGURE 7: Insert an adequately keyed bar in the differential. Connect the bar to suitable lifting gear. The approximate weight of the differential complete with crown wheel is 60 kg (132 lb).
With the help of a bar extract the complete differential unit (28).

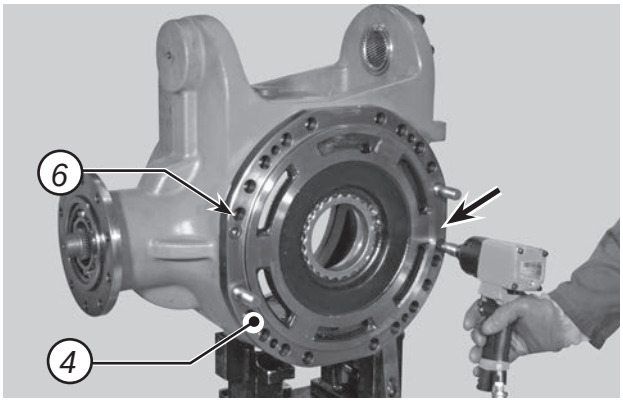


FIGURE 8: Tighten two safety M20 studs in the main body. Loosen and remove the intermediate cover (4) screws (6).

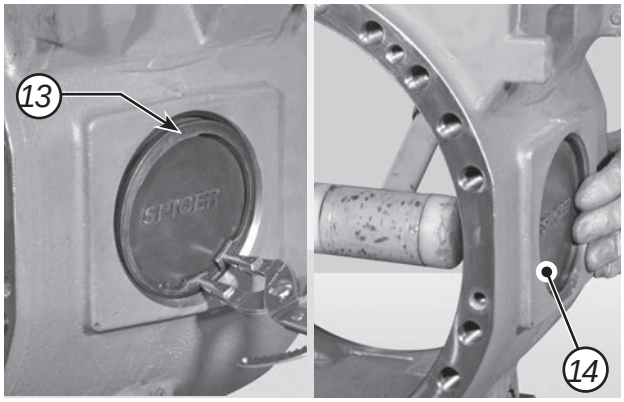


FIGURE 9: Remove the snap ring (13) and the cap (14).

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

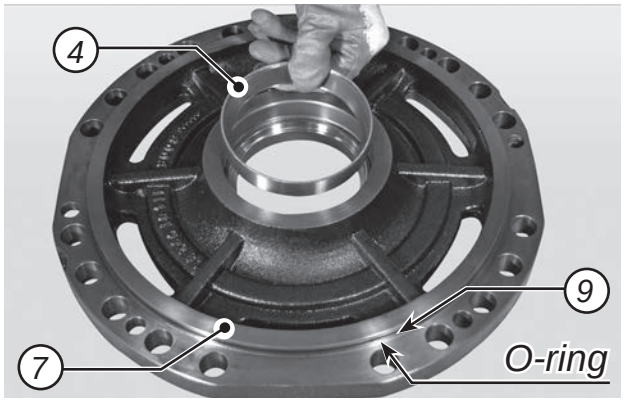


FIGURE 10: If the bearings need replacing, extract the external thrust blocks of the bearings (4) from middle cover (7).

NOTE:

Inspect the o-ring (9).

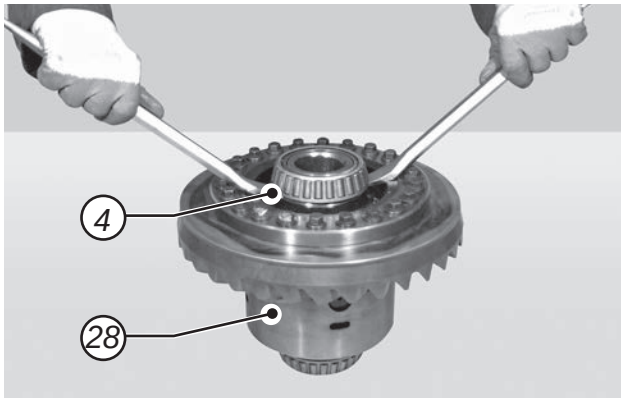


FIGURE 11: If the bearing needs replacing, extract the bearings (4) from the differential carrier (28).

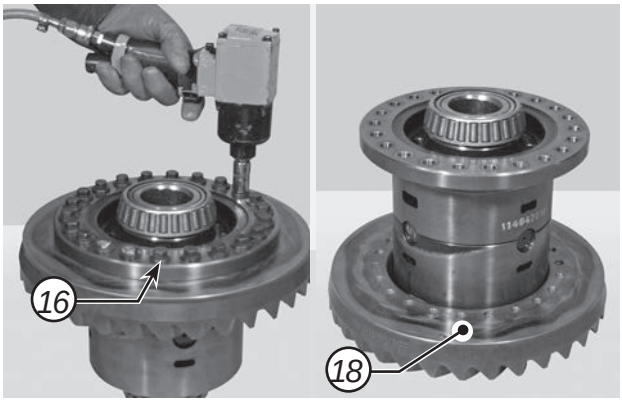


FIGURE 12: Remove the ring gear (18) capscrews (16).

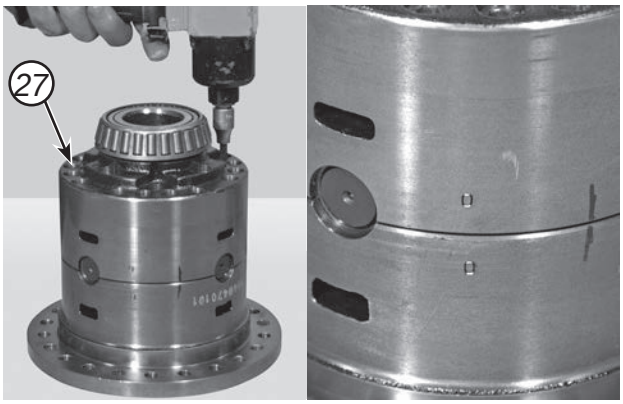


FIGURE 13: Remove the screws (27) joining the differential unit half box.

NOTE:

Mark the coupling marks.

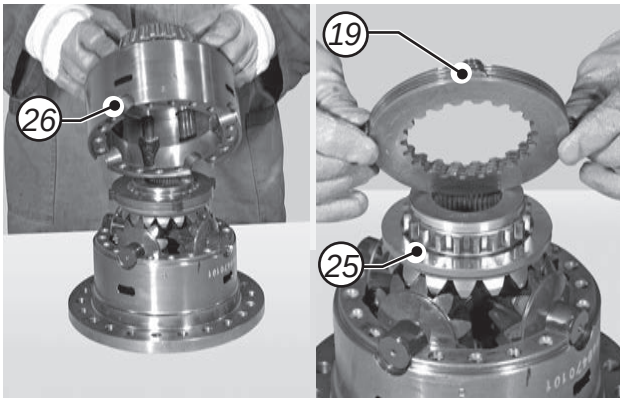


FIGURE 14: Remove the upper half box (26) and remove the clutch pack (29).

⚠CAUTION

If the clutch pack does not need replacing, avoid swapping discs position.

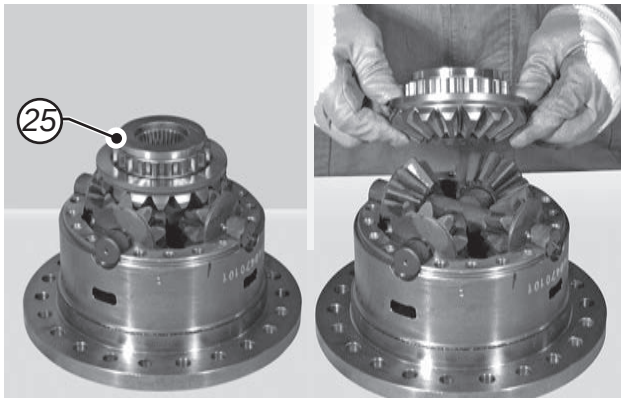


FIGURE 15: Remove the planetary gear (25).

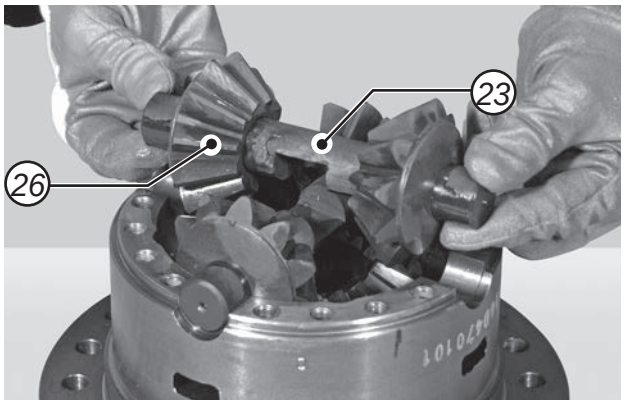


FIGURE 16: Remove shafts (24), complete with planetary gears (26) and spherical shoulder washers (23).

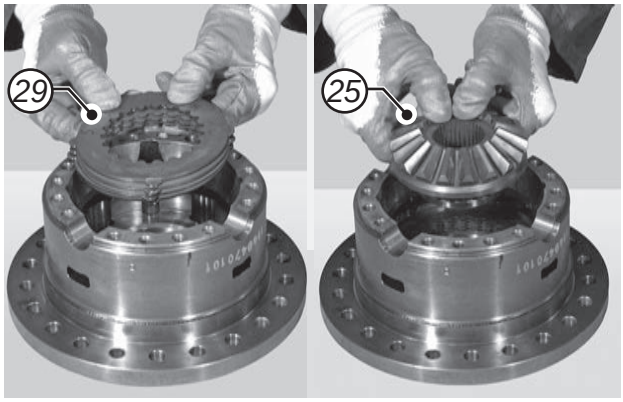


FIGURE 17: Extract from the differential unit (17) the 2nd planetary gear (25).
Remove the 2nd clutch pack (29) and shim set (19).

⚠CAUTION

If the clutch pack does not need replacing, avoid swapping discs position.

ASSEMBLY

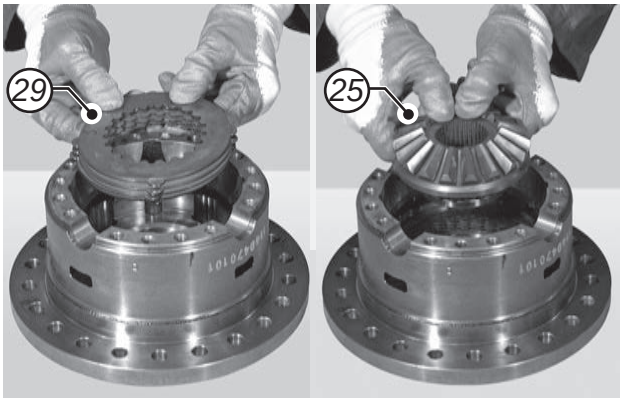


FIGURE 18: Insert the planetary gear (25) and the whole friction unit (29).

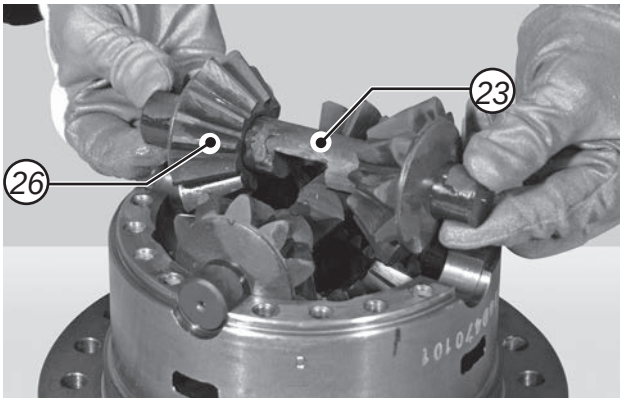


FIGURE 19: Install the planetary gears (26) and spherical shoulder washers (25) onto the bolts (24). Install the planetary gear set.

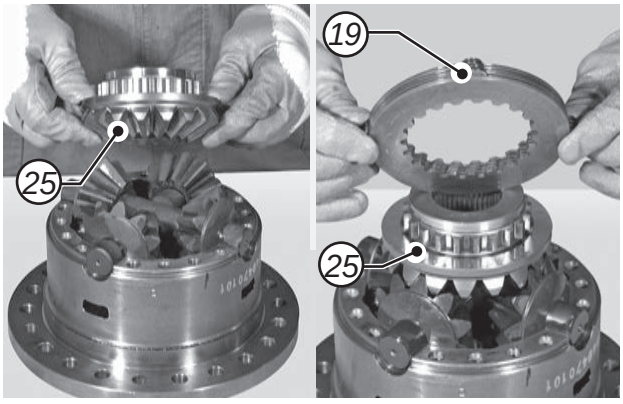


FIGURE 20: Insert the planetary gear (25) and the whole friction unit (29).

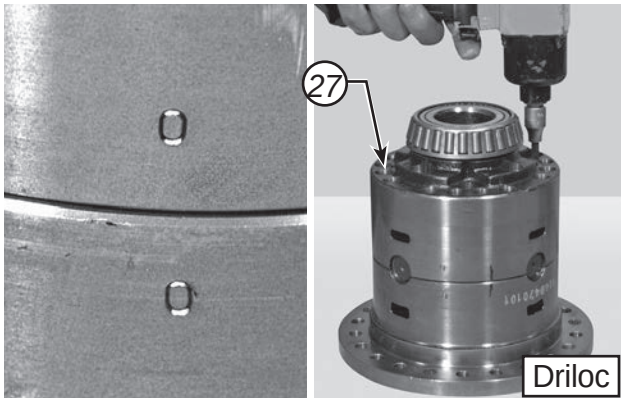


FIGURE 21: Assemble the half box with screws (27).

⚠CAUTION

The match marks on the two half-boxes must correspond.

Use only new screws pre-treated with Driloc locking adhesive. Threads must be cleaned from oil.

Degrease only non pre-treated threads.

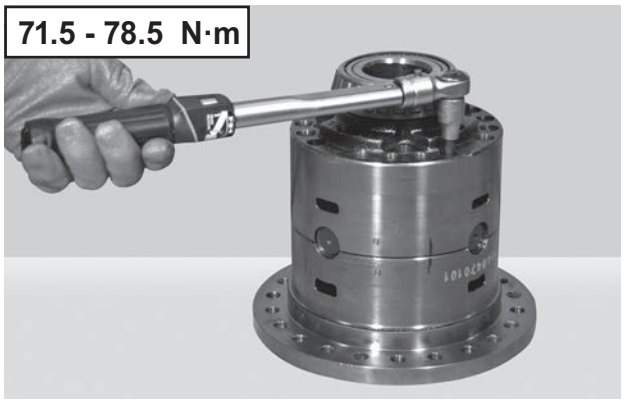


FIGURE 22: Fit the complete differential unit in a vice and tighten the screws (27) holding the two half boxes together to a torque of 71.5 - 78.5 N·m.

⚠CAUTION

Tighten screws using the criss-cross method.

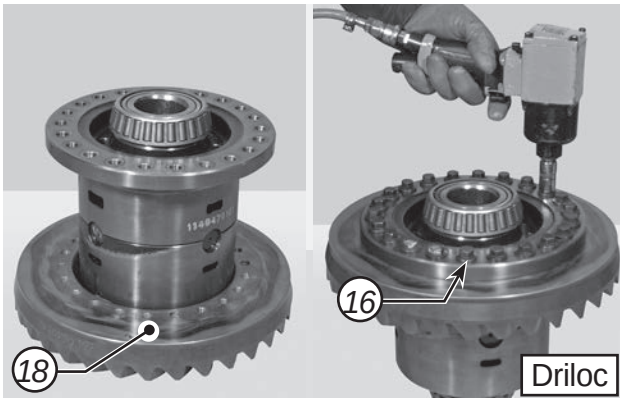


FIGURE 23: Mount the ring gear (18) and fasten it to the differential with screws (16).

⚠CAUTION

Use only new screws pre-treated with Driloc locking adhesive. Threads must be cleaned from oil.

Degrease only non pre-treated threads.

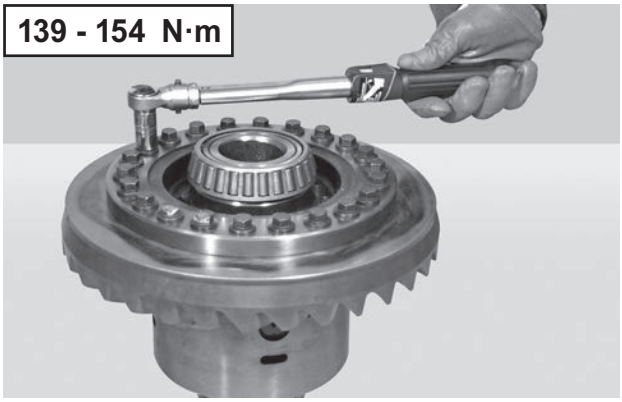


FIGURE 24: Lock the ring gear (6) by tightening the screws (4) to a torque of 139 - 154 N·m.

⚠CAUTION

Use the criss-cross method.

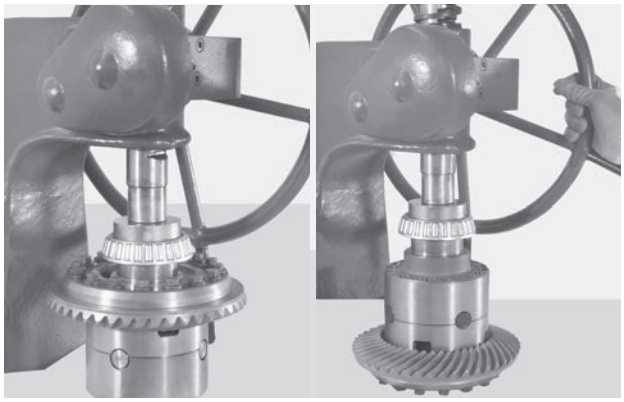


FIGURE 25: Position the differential unit under a press and, using a driver with an adequate diameter, install the first bearing (4).
Turn the unit upside down and install the second bearing (4).

⚠CAUTION

Pay particular attention; position a shim with adequate diameter in order to engage the internal ring of bearing without engaging the cage.

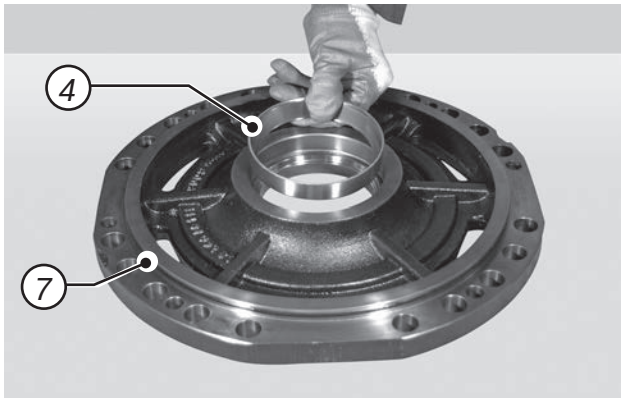


FIGURE 26: Only if bearings are replaced, insert the thrust blocks of the bearings (4) into the intermediate covers (7).

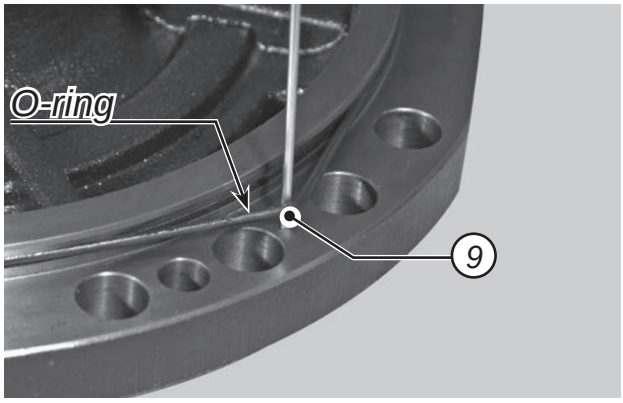


FIGURE 27: Install the new o-ring. Lubricate before installing.

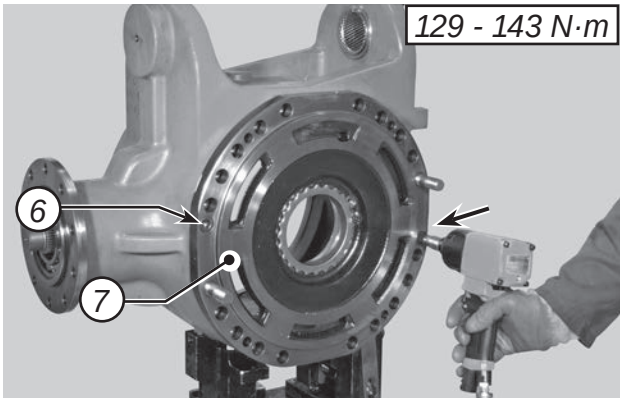


FIGURE 28: Install the intermediate cover (7) the opposite side of the ring gears; lock cover with screws (6). Tighten screws to a torque of 129 - 143 N·m.

⚠CAUTION

Use only new screws pre-treated with locking adhesive.

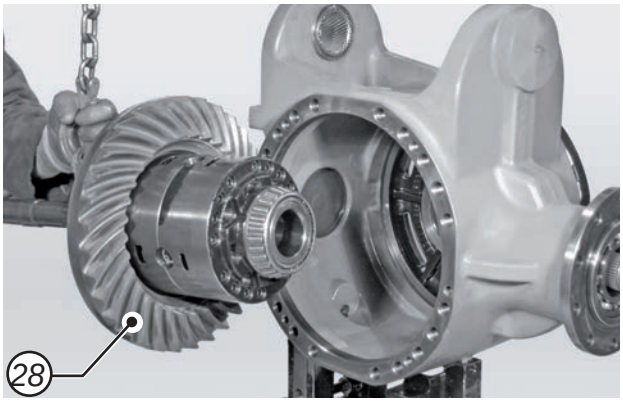


FIGURE 29: Position the differential unit (28) in the central body with the help of a bar and install the middle cover.

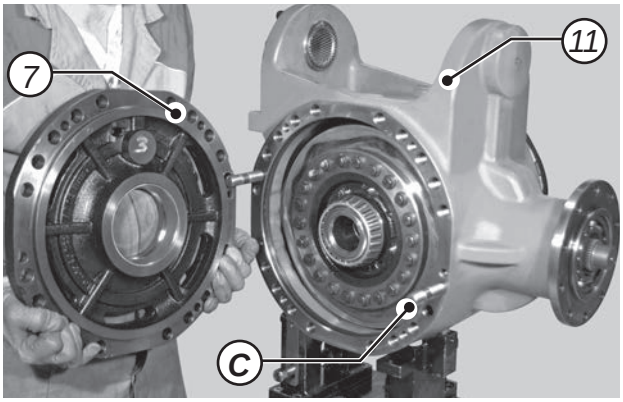


FIGURE 30: Tighten the two safety screws “C” into the main body (11) and install the intermediate cover (7).

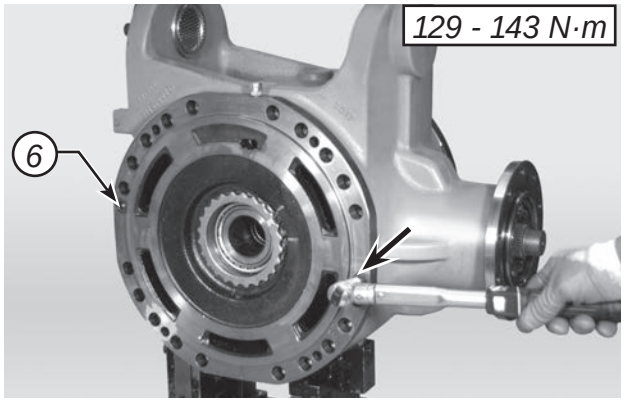


FIGURE 31: Tighten screws (6) to a torque of 129 - 143 N·m.

⚠CAUTION

Use only new screws pre-treated with locking adhesive.

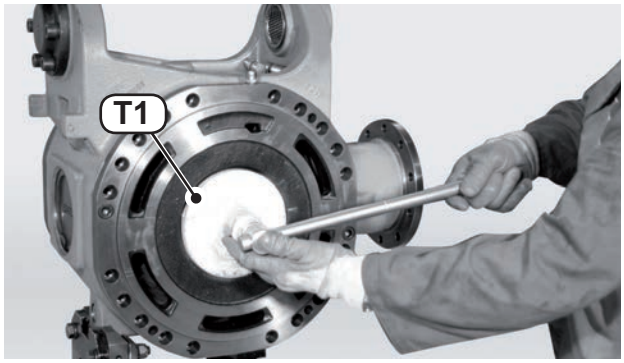


FIGURE 32: Only if ring nuts have been removed, tighten the ring nut (3) on ring gear side until clearances between pinion and ring gear are zeroed. Then, loosen by about 1/4 turn.

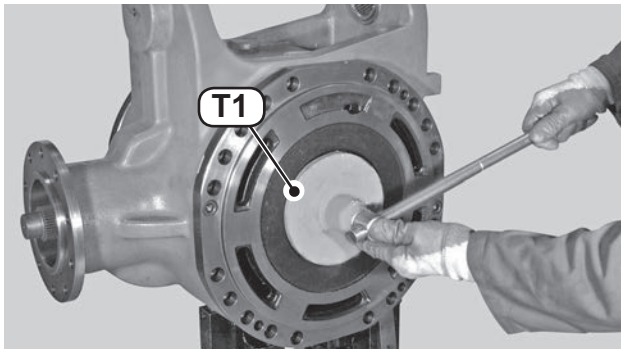


FIGURE 33: Only if ring nuts have been removed, preload bearings with ring nut (3) on non-ring gear side in order to increase the torque of the pinion.

⚠CAUTION

In the case of used bearings, check thrust torque; in the case of new bearings, check continuous torque.

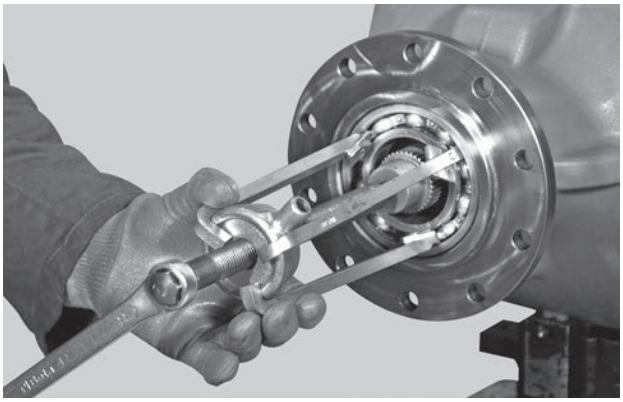


FIGURE 34: FLANGED REDUCER VERSION ONLY
Using an extractor for ball bearings, remove the external reduction unit bearing from the central box.

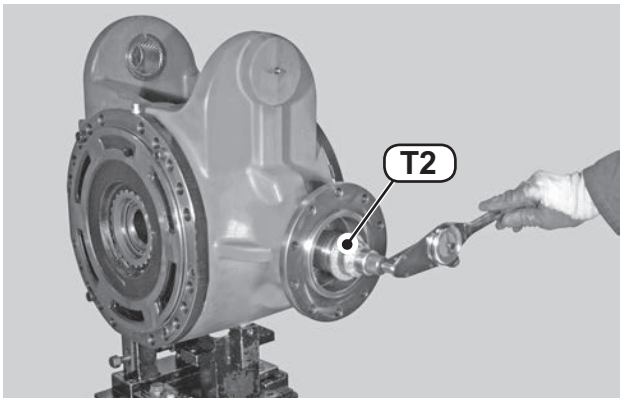


FIGURE 35: Apply onto the pinion (10) the bar-hold T2 (See drawing T2 p. 62) and with the help of a torque meter and check that torque will increase by 0.5 - 1.0 N·m as a result of differential bearing preload.
Example: pinion torque: 2.3 - 3.2 N·m
Pinion + differential torque: 2.8 - 4.2 N·m.

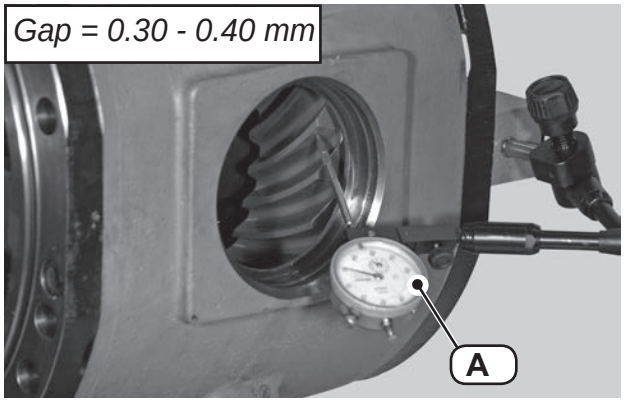


FIGURE 36: Introduce a dial indicator “A” with long tracer through the hole provided for the cap. Position the tracer on the side of a tooth of the ring gear, approximately 5 mm from the outer rim; preload by about 1 mm and zero the comparator.
As you hold the pinion in position, move the ring gear manually in both directions to check clearance between pinion and ring gear.
Standard clearance: 0.30 - 0.40 mm

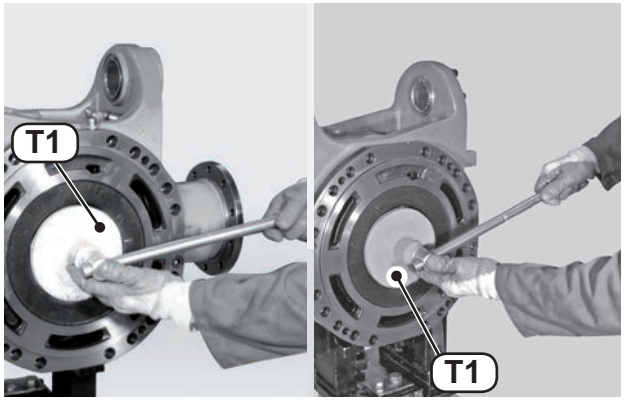


FIGURE 37: Adjusting clearance between pinion and ring gear.
To INCREASE: loosen the ring nut on ring gear side and tighten the ring nut on non-ring gear side by the same measure.
To DECREASE: perform the same operations inversely.
To rotate ring nuts, use special wrench T1 (See drawing T1 p. 61).

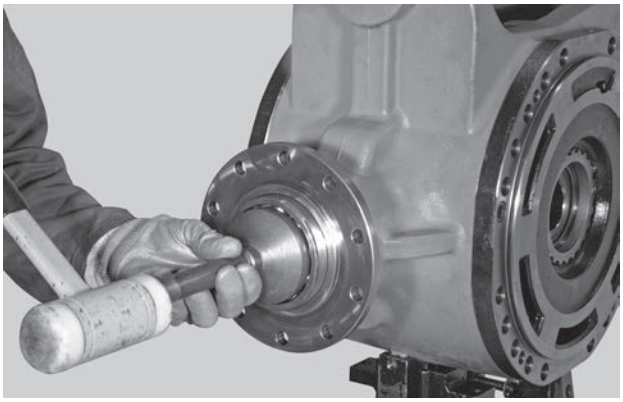


FIGURE 38: Using a plug of suitable diameter, fit the external reduction unit bearing to the central box.

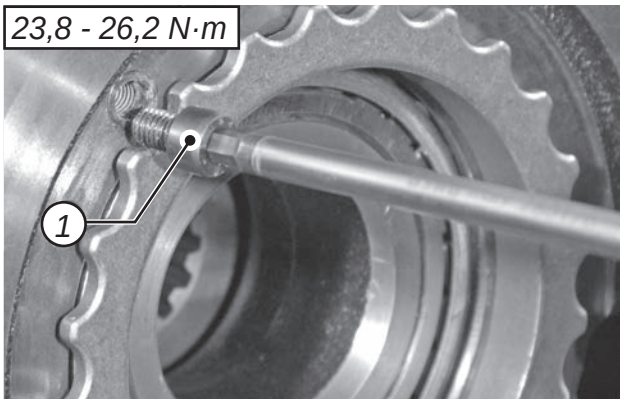


FIGURE 39: Install the screw into the hole and tighten to a torque wrench setting of 23.8-26.2 N·m.

⚠CAUTION

Use only new screws pre-treated with locking adhesive.

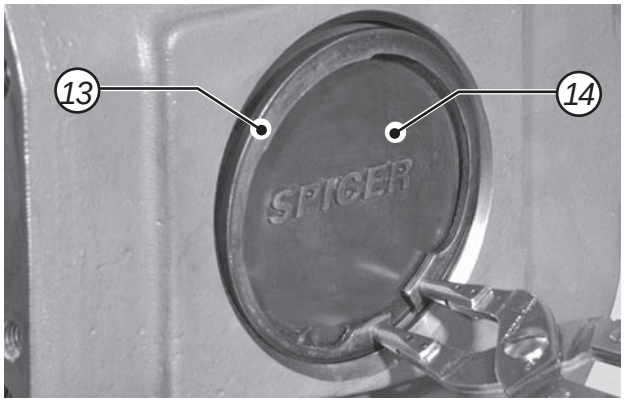


FIGURE 40: Using pliers, install the cap (14) with the snap ring (13).

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

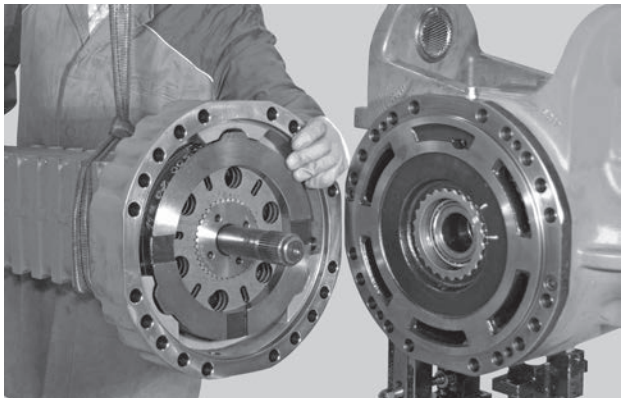


FIGURE 41: The arm was attached to a sling during dismantling.
The approximate weight of the arm complete with brakes and planetary reduction gear is 351 kg (774 lb).
Check integrity and position of the arm's o-ring;
Install the complete arm.

NOTE:

To assist axle shaft centering, slightly move the wheel hub.

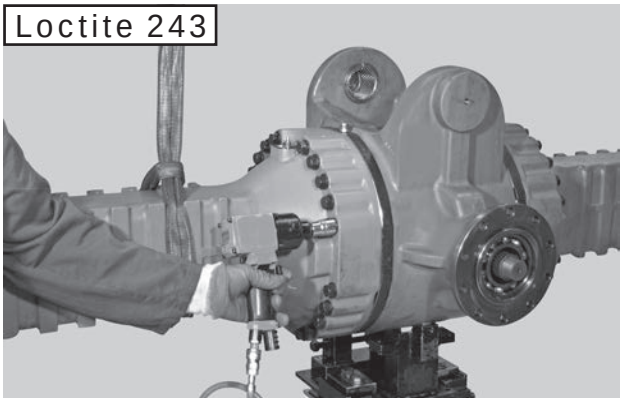


FIGURE 42: Temporarily lock the arm with screws previously coated with Loctite 243; tighten lightly to make the unit touch the main body.

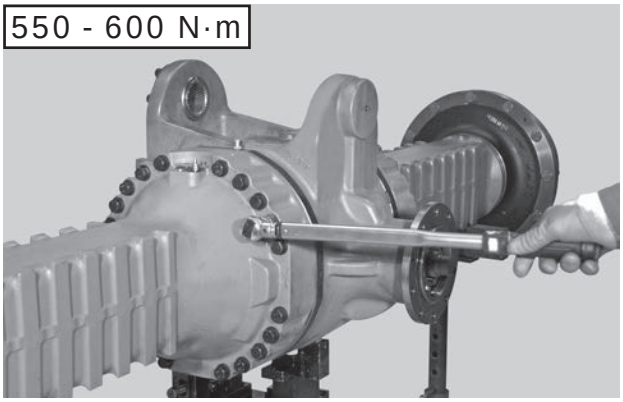
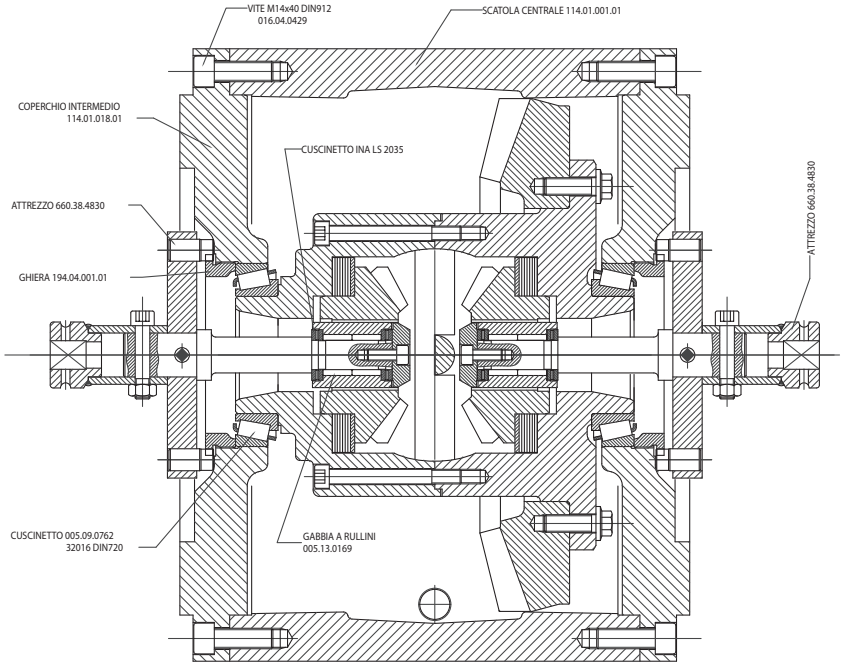


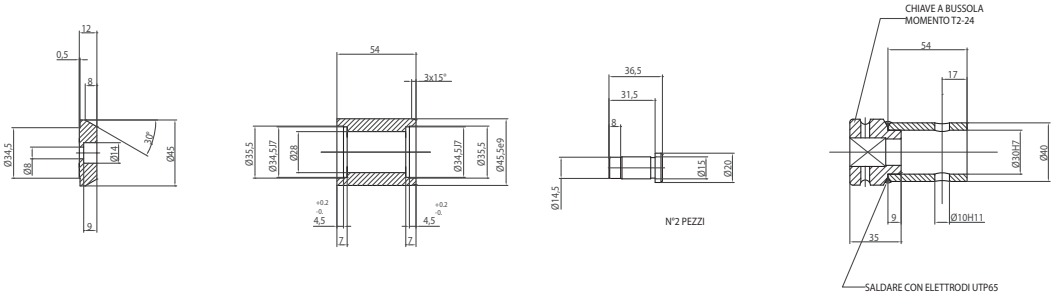
FIGURE 43: Secure in position with the screws (3) tightening to a torque of 550 - 600 N·m.

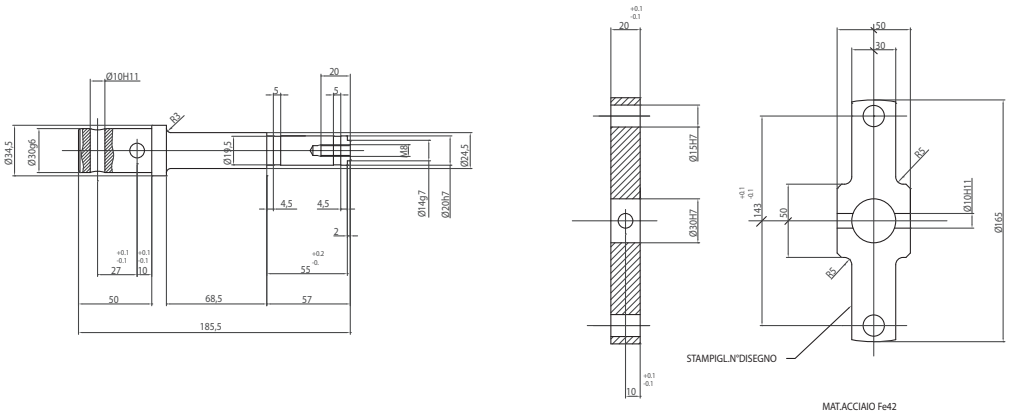
SPECIAL TOOLS

T1

P/N: 910.38.4830

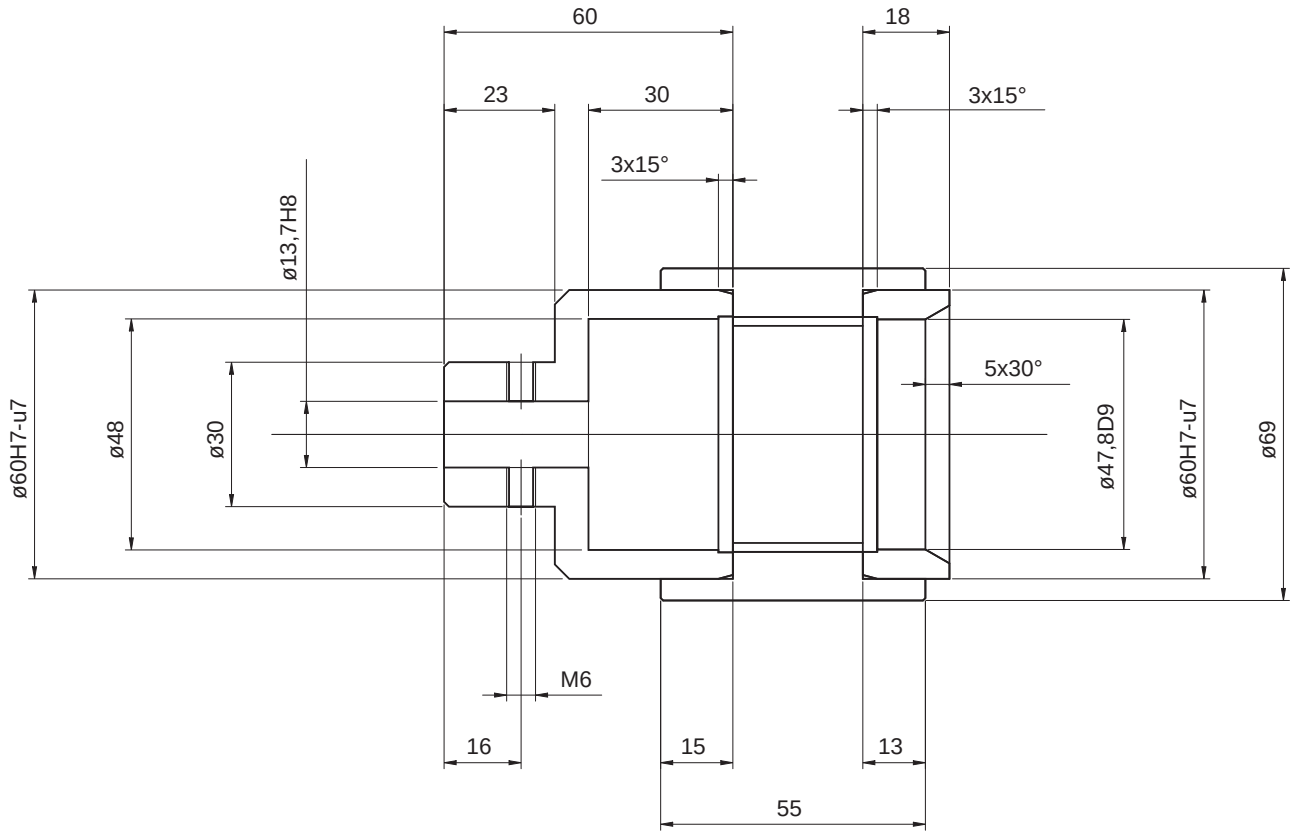






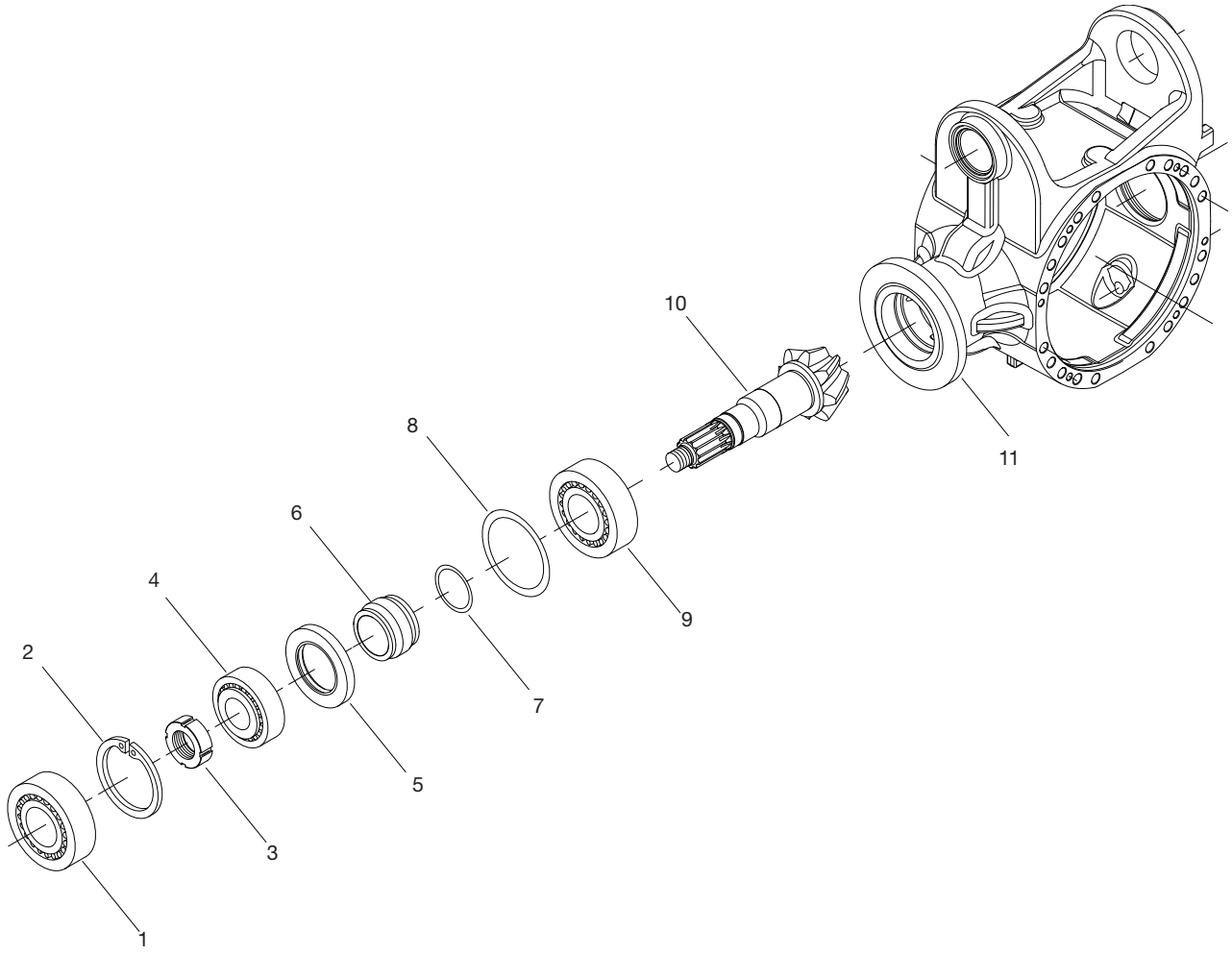
T2

P/N: 910.04.4588



BEVEL PINION

EXPLODED VIEW



DISASSEMBLY

⚠CAUTION

Before draining oil, release the internal pressure, for details see OIL DRAINING MANDATORY PROCEDURE p. 13.

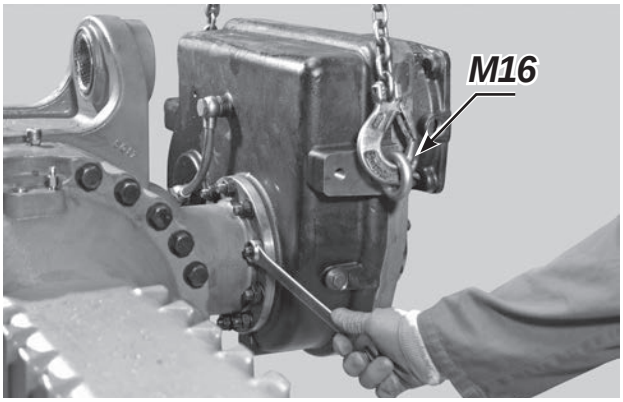


FIGURE 1: Install a double joint lifting eye size M16, connect to a suitable lifting gear, and tighten. The approximate weight of the unit is 150 kg (331 lb).
Remove fastening nuts from the reduction unit.

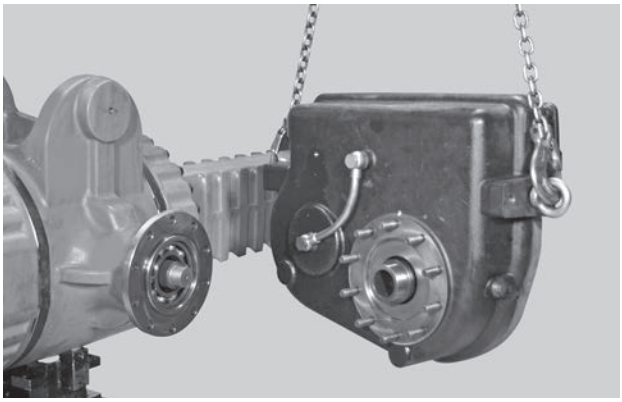


FIGURE 2: Disjoin the entire reduction unit (9) from the axle and place it on a bench.

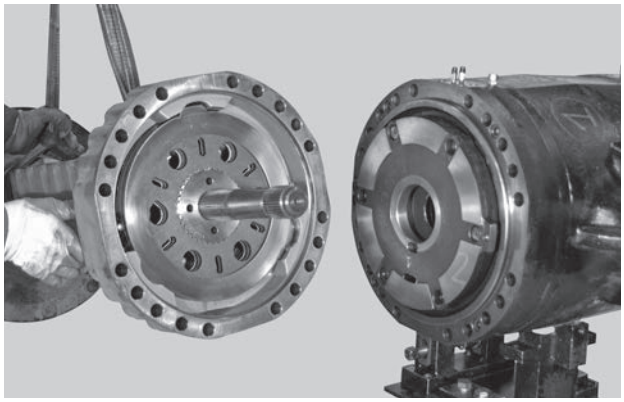


FIGURE 3: Remove the complete arms and the differential unit.
For details, see SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 39 and SERVICE BRAKE p. 33.

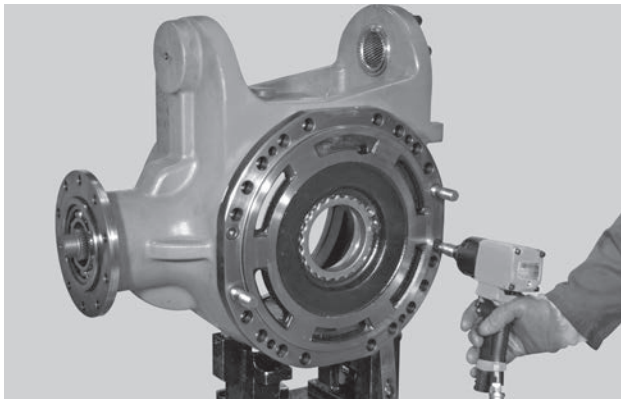


FIGURE 4: Tighten two safety M20 studs in the main body. Loosen and remove the capscrews (6) of intermediate cover (4). For details, see DIFFERENTIAL p. 51.

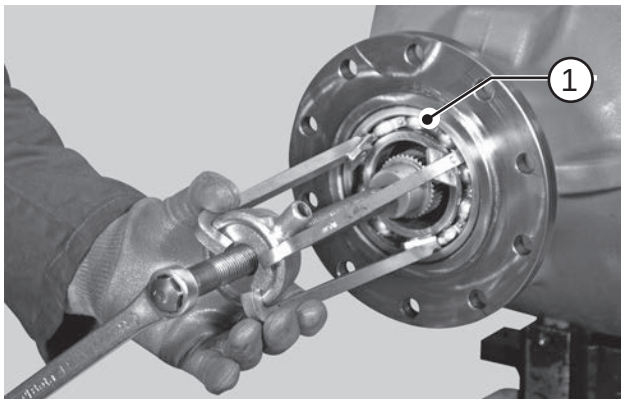


FIGURE 5: FLANGED REDUCER VERSION ONLY.
Using an extractor for ball bearings, remove the external reduction unit bearing from the central box.

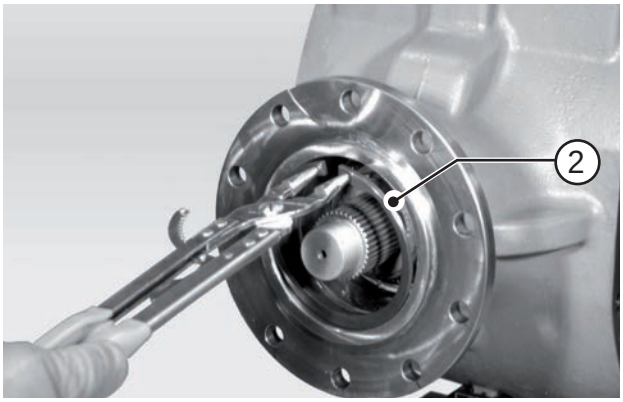


FIGURE 6: Remove the snap ring (2).

NOTE:

Take care not to bend the snap ring (2).

⚠WARNING

Removal of the snap rings can cause personal injuries. You must wear appropriate safety equipment. To avoid injury to eyes, wear eye protection equipment.

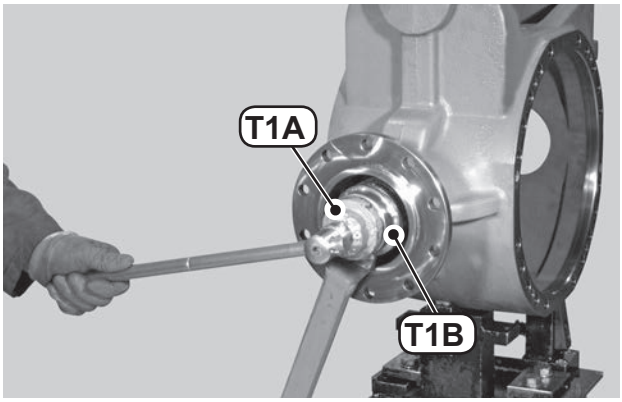


FIGURE 7: Position wrench T1B (see drawing T1 p. 73) onto the ring nut (3) and apply bar hold T1A (see drawing T1 p. 73) to the pinion (10). Stop wrench T1B and rotate the pinion so as to release and remove the ring nut (3).

NOTE:

If disassembly is difficult, heat the ring nut to approximately 212 °F [100 °C].

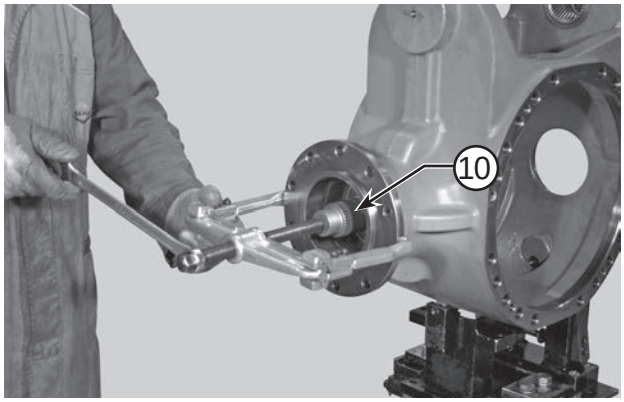


FIGURE 8: Extract the pinion (10) complete with the internal bearing cone (9), the spacer (6), and shims (8).

NOTE:

The bearing cups of the bearing cones remain in the central body.

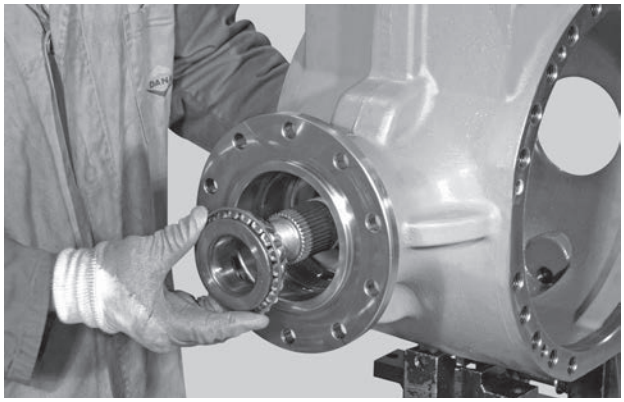


FIGURE 9: Remove the external pinion bearing (4).

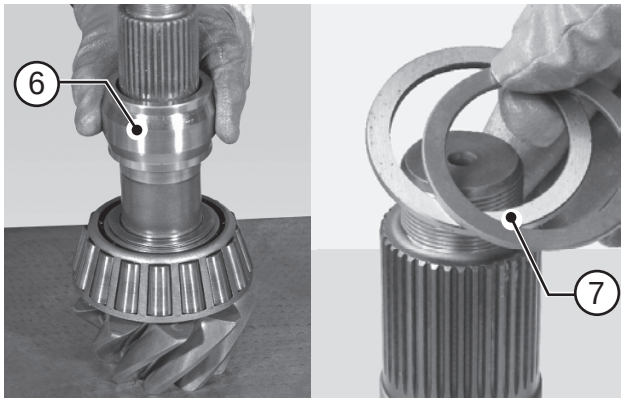


FIGURE 10: Remove the spacer (6) and the calibrated spacer (7).

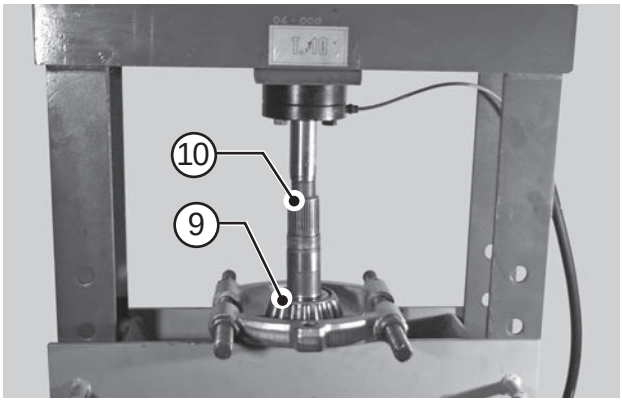


FIGURE 11: Using a puller and a press, remove the inner bearing cone (9) from the pinion (10).

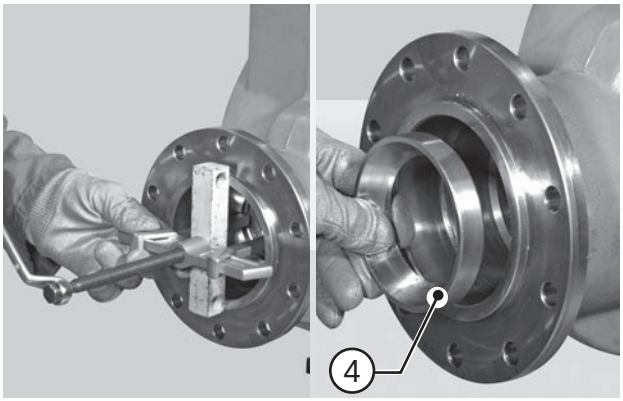


FIGURE 12: Remove the bearing cup of the bearing cone (4).

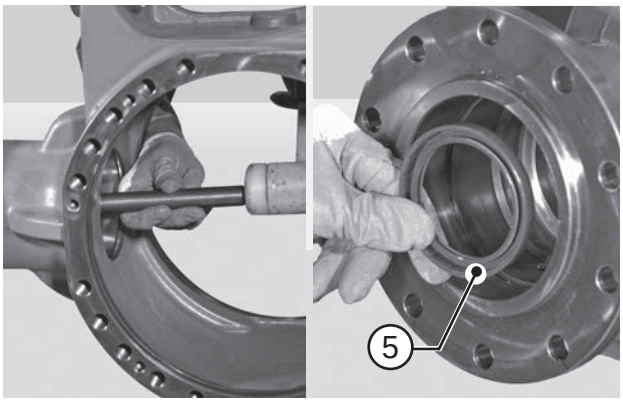


FIGURE 13: Remove sealing ring (5).

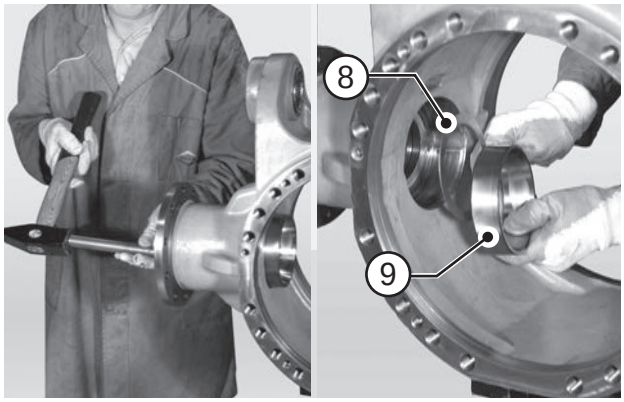


FIGURE 14: Insert a drift in the appropriate holes. Remove the bearing cup of the internal bearing cone (9) as well as the shim washers (8).

ASSEMBLY

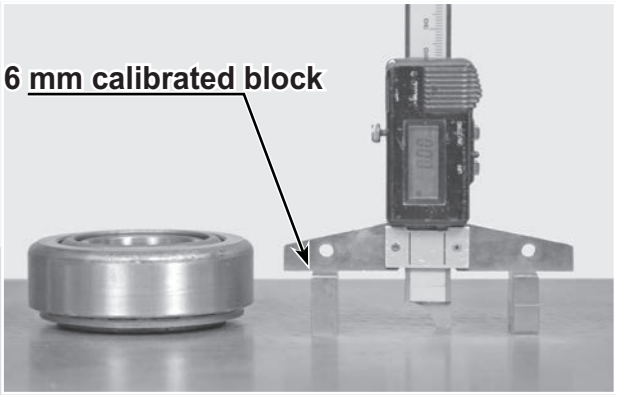


FIGURE 15: Reset a depth gauge on a calibrated block (whose known thickness is 6 mm.).

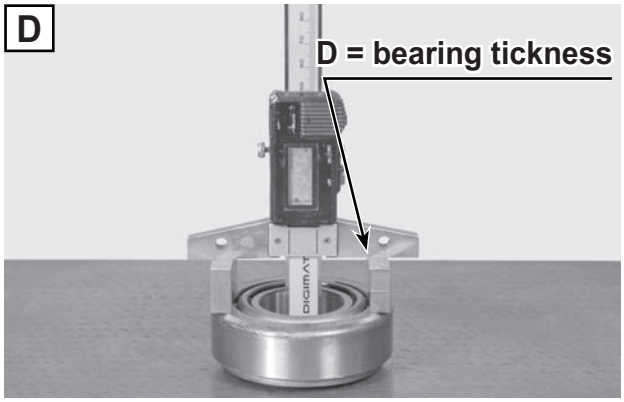


FIGURE 16: With a calibrated block on a faceplate, allow the bearing cone to set by rotating them in both directions and by applying a vertical thrust position the calibrated block on the external bearing cups. Check overall thickness of bearing.
D = 44,45 mm

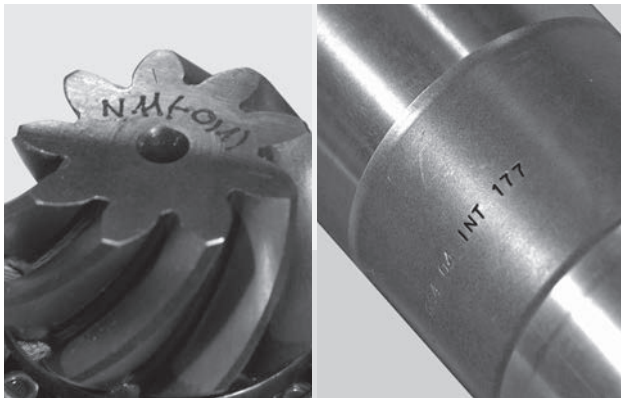


FIGURE 17: Check nominal dimension “INT” as marked on the pinion. Add up to or subtract from “INT” the variation indicated as “Y” to obtain the actual center distance “I”.
EXAMPLE: I = (INT - Y) = 177 - 0,1 = 176,9 mm

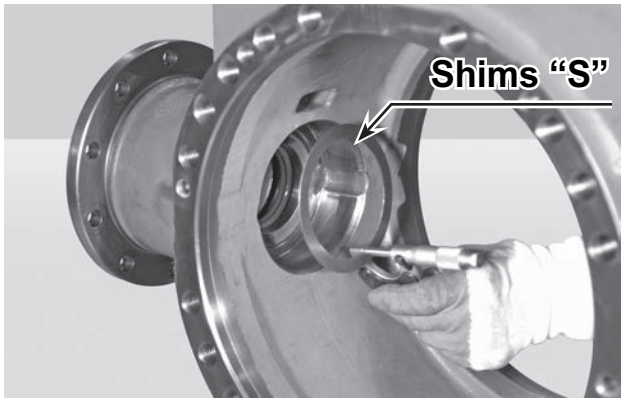


FIGURE 18: Calculate shims “S” for insertion under the bearing cup of the inner bearing cone using the following formula:
S = 222.2 - (I + D)
where: 222.2 = fixed dimension
I = actual pinion center distance
D = Total bearing thickness;
EXAMPLE: S = 222.2 - (176.9 + 44.45) = 0.85 mm

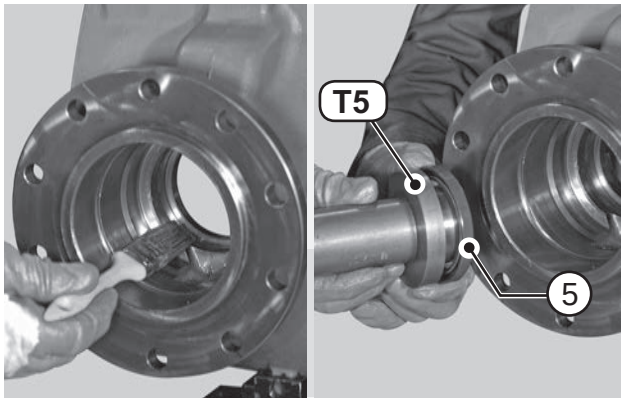


FIGURE 19: Lubricate the outer surface of the new sealing ring (5) and fit it onto the main body (11) using tool T5 (See drawing T5 p. 78).

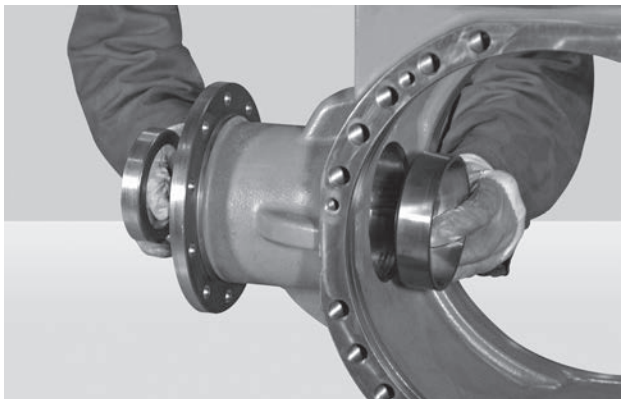


FIGURE 20: Using special tool T2 (See drawing T2 p. 74). Partially insert the bearing cup of the bearing cones and shims.

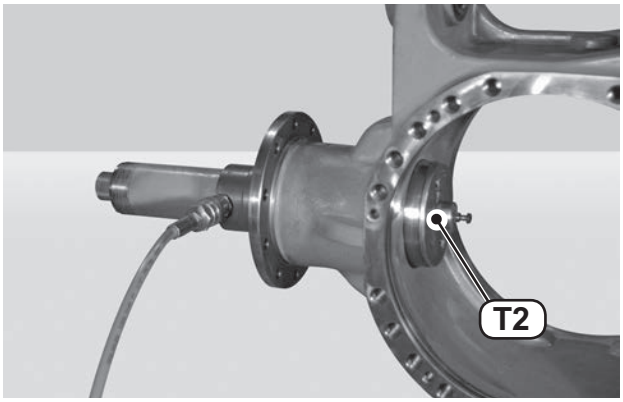


FIGURE 21: Connect the tension rod to the press and move the bearing cup of bearing cones into the seats. Disconnect the press and remove the tension rod.

NOTE:

Before starting the next stage, make sure the bearing cup has been completely inserted into its seat.

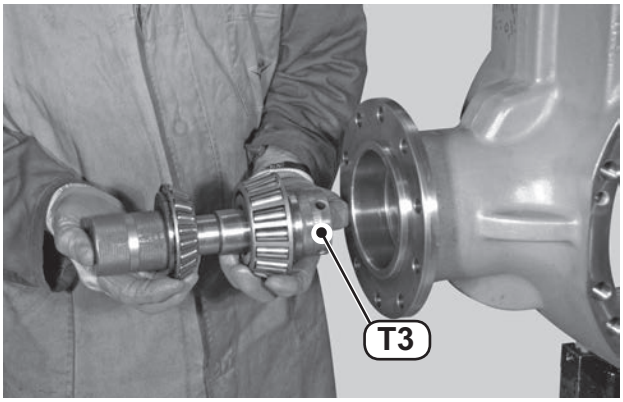


FIGURE 22: CALCULATING PINION BEARINGS ROLLING TORQUE
Introduce tool T3 (See drawing T3 p. 76) complete with bearings (10) into the central housing; tighten by hand to eliminate the axial gap.

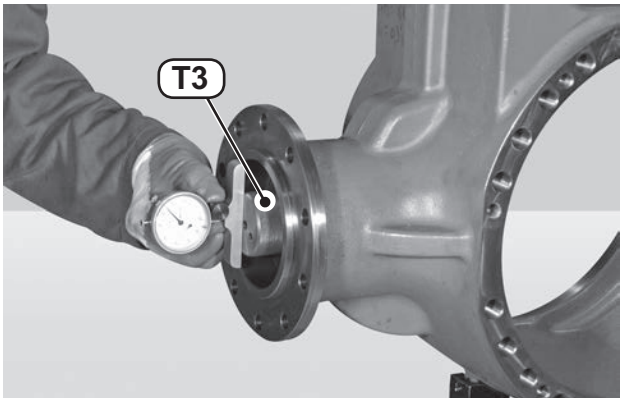


FIGURE 23: Introduce the tracer of a depth gauge 'DDG' into either side hole of tool T3 (See drawing T3 p. 76).
Reset the depth gauge with a preload of about 3 mm.

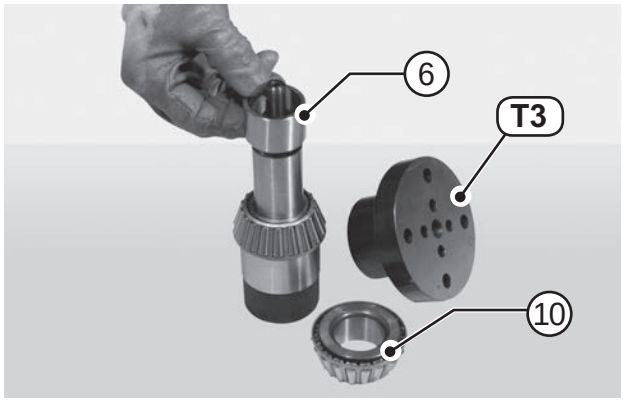


FIGURE 24: Remove the depth gauge and remove tool and bearing cone kits from the main body.
Reinstall every part, also introducing a spacer (6) the shims (7) between bearing cones (4, 9). Tighten the entire pack by hand until a rolling torque is definitely obtained.

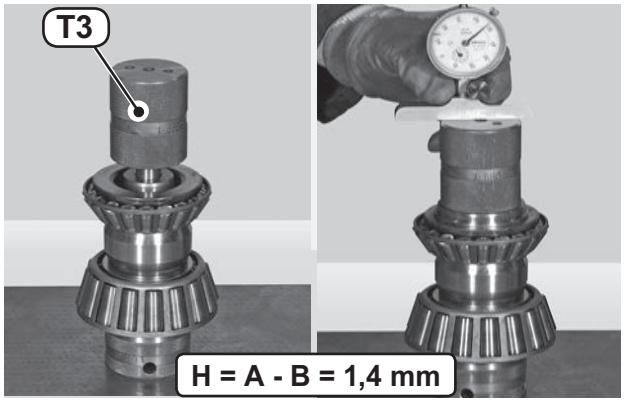


FIGURE 25: Introduce depth gauge "DDG" in tool T3 (See drawing T3 p. 76) and measure deviation "H" from the previous measurement.
EXAMPLE: H = A - B = 1.4 mm.

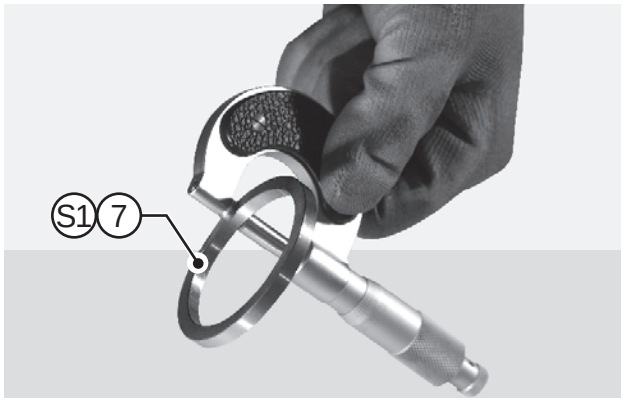


FIGURE 26: Deviation "H" must be added to a set value of 0.10 mm to obtain the calibrated spacer value "S1" (7) for insertion between inner bearing cone (9) and spacer (6).
Dimension "S1" must be rounded off to the higher 5/100.
EXAMPLE: S1=H+X=1.7 + 0.1 =1.7 mm

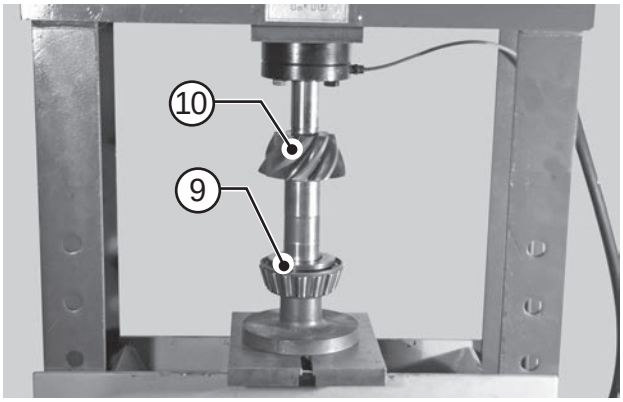


FIGURE 27: Position the internal bearing (9) and the pinion (10) under a press; force the bearing onto the pinion.

FIGURE 30: Heat the external bearing cone (9) to a temperature of about 212 F° [100 C°] and fit it on to the pinion (10).

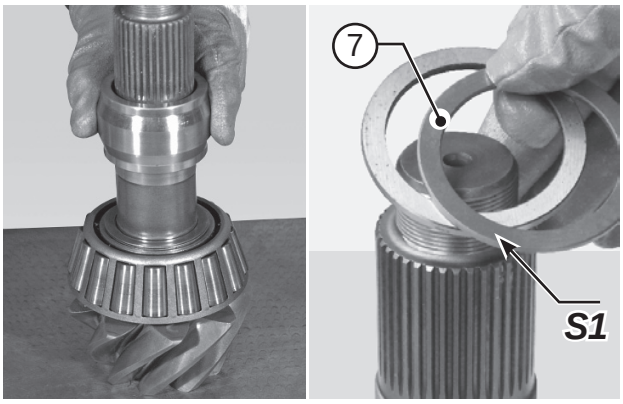


FIGURE 28: Insert spacer (6) and calibrated spacers “S1” (7). Refer and keep to the positions marked during disassembly.

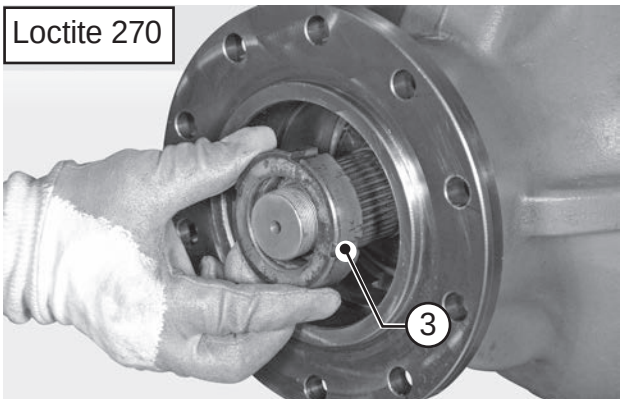


FIGURE 31: Apply Loctite 270 to the thread of the pinion ring nut (3) and tighten the nut onto the pinion.

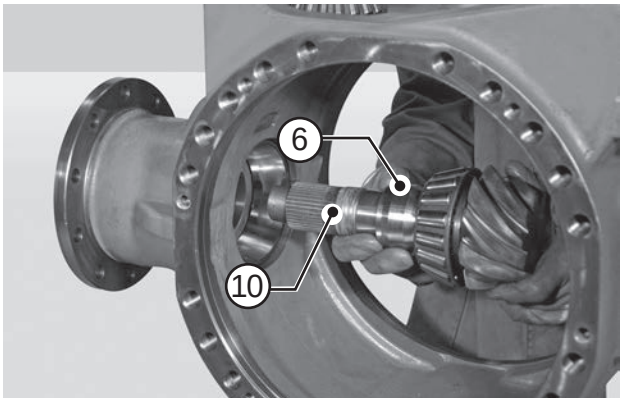


FIGURE 29: Oil seal ring lips. Fit the pinion (10), calibrated spacers “S1” (8) and spacer (6) in the main body (11).

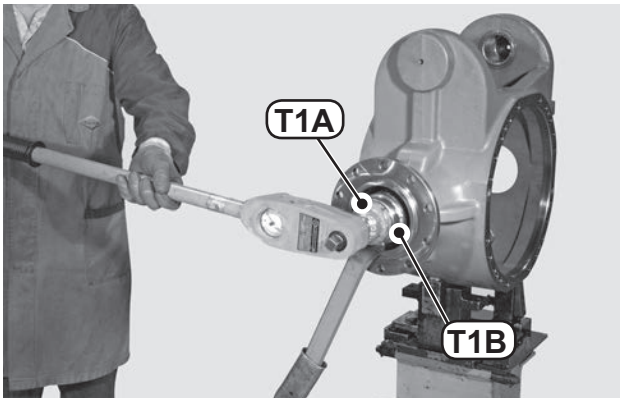


FIGURE 32: Apply special wrench T1B (see drawing T1 p. 73) to the ring nut (3) and bar-hold T1A (see drawing T1 p. 73) to the pinion (10). Lock the wrench T1B and rotate the pinion using a torque wrench, up to a minimum required torque setting of 900 N·m.

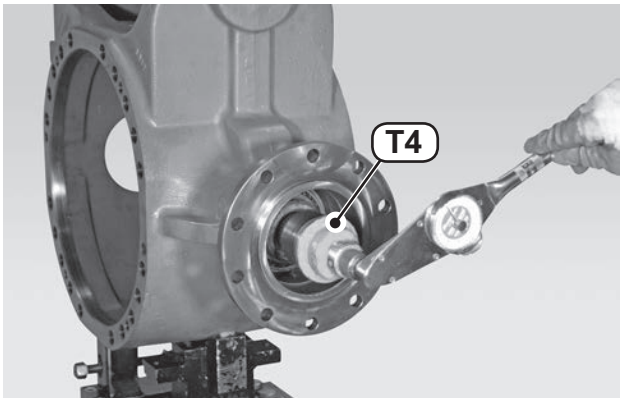


FIGURE 33: Apply onto the pinion (10) the bar-hold T4 (See drawing T4 p. 77) and with the help of a torque meter, check the torque of the pinion (10). Tightening Torque: 2.3 - 3.2 N·m

⚠CAUTION

If torque exceeds the maximum value, then the size of shim “S1” (7) between the bearing cone (8) and the spacer (6) needs to be increased.

If torque does not reach the set value, increase the torque setting of the ring nut (3) in different stages to obtain a maximum value of 1000 N·m. If torque does not reach the minimum value, then the size of shim “S1” (7) needs to be reduced.

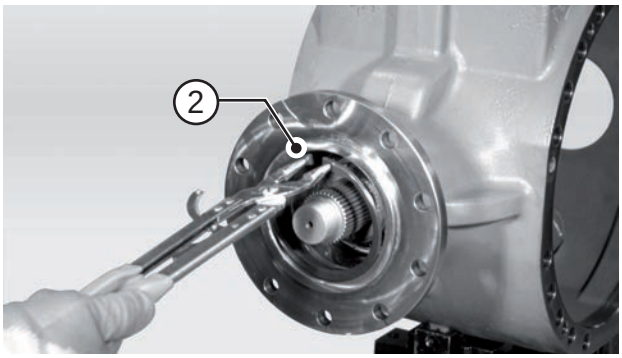


FIGURE 34: Insert the snap ring (2).

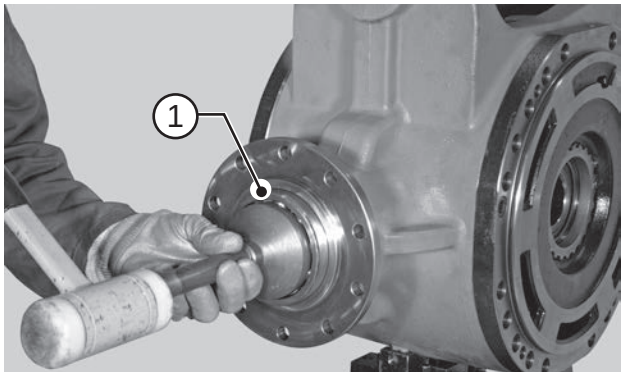


FIGURE 35: Using a plug of suitable diameter, fit the external reduction unit bearing (1) in the central box.

⚠WARNING

Personal injury can result when installing snap ring. The appropriate safety equipment must be worn. To avoid injury to your eyes, wear protective glasses during this procedure.

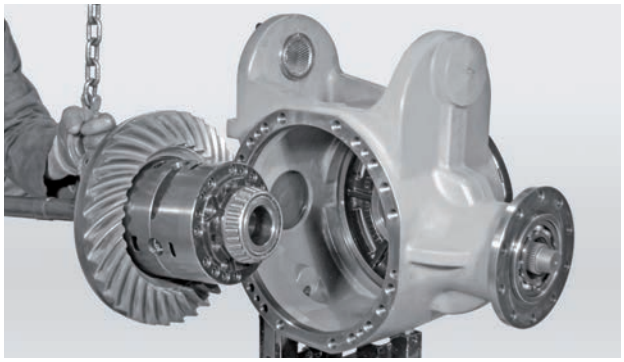


FIGURE 36: Re-install the differential unit and the intermediate cover.

⚠CAUTION

If the crown has been replaced, reinstate clearances.

For details, see DIFFERENTIAL p. 51.

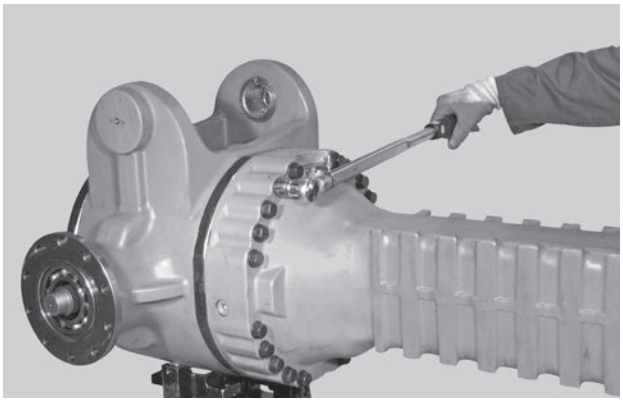


FIGURE 37: Re-install the arms.
For details, see SERVICE BRAKE p. 33 and SERVICE BRAKE AND NEGATIVE PARKING BRAKE p. 39.

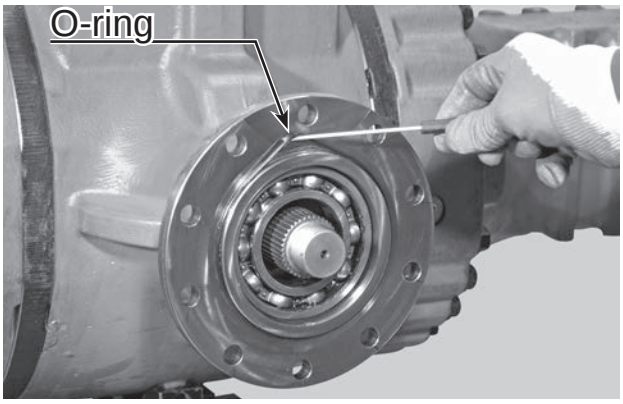


FIGURE 38: Install the new o-ring. Lubricate before installing.

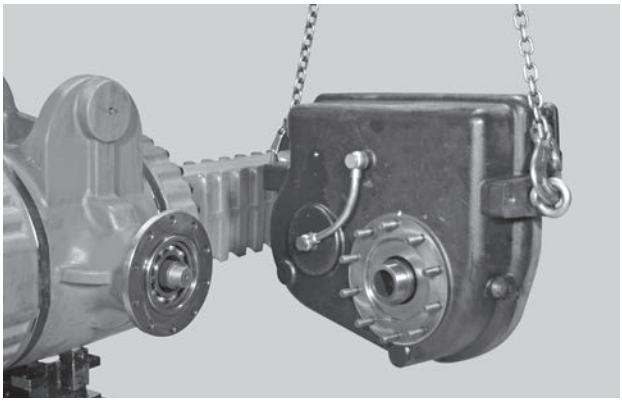


FIGURE 39: The reduction unit was attached to a sling during dismantling. The approximate weight of the reduction unit is 150 kg (330 lb).
Install the entire reduction unit.

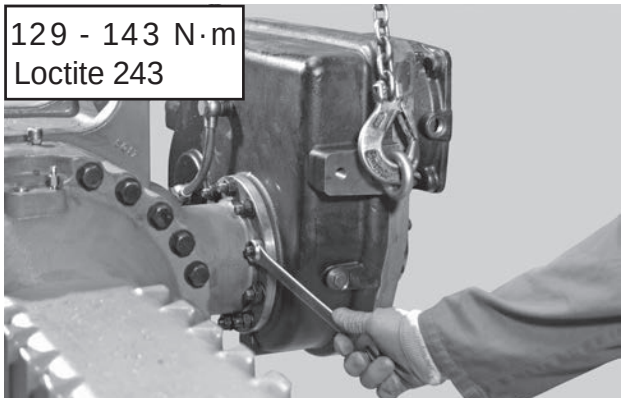


FIGURE 40: Assemble the reduction unit onto the axle. Fasten the support planes (turn flange to assist assembly). Insert nuts by applying Loctite 243 and tighten to 129 - 143 N·m.

SEAL RING REPLACEMENT

DISASSEMBLY

ONLY WHEN REPLACEMENT IS NECESSARY

Remove the pinion seal ring following these instructions:

1 - If disassembly is difficult, heat the check nut of the flange at 80°C.

NOTE:

Heating is meant to loosen the setting of Loctite on the nut.

2 - Loosen and remove the nut; also remove the o-ring.

3 - Remove the flange complete with guard.

4 - Remove the sealing ring.

If the pinion, the bearings or other parts must be replaced, refer to the procedure BEVEL PINION p. 63 and DIFFERENTIAL p. 51.

ASSEMBLY

ONLY IF PREVIOUSLY DISASSEMBLED

If the pinion, the bearings or other components must be installed and adjusted, refer to the procedure BEVEL PINION p. 63 and DIFFERENTIAL p. 51.

1 - Fit the new seal ring in the main body.

2 - Oil seal ring lips and install flange.

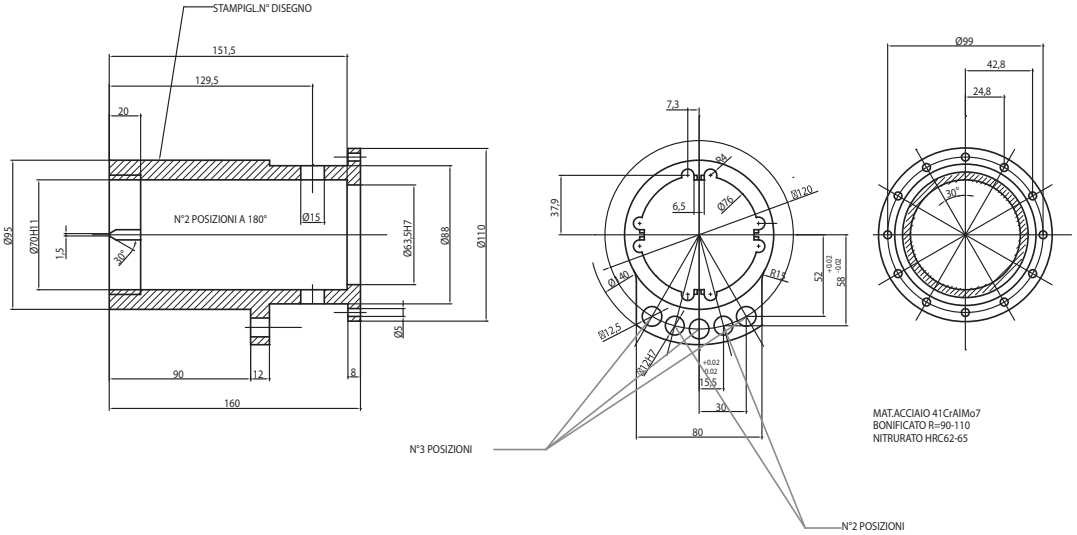
3 - Apply Loctite 242 to the threaded part of the pinion.

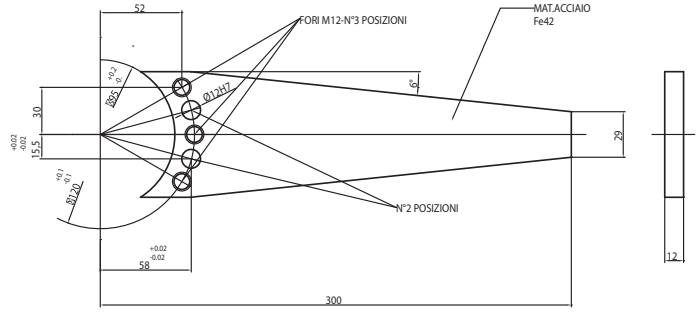
4 - Insert o-ring the nut and tighten it using a torque wrench. Torque wrench setting: 280-310 N·m

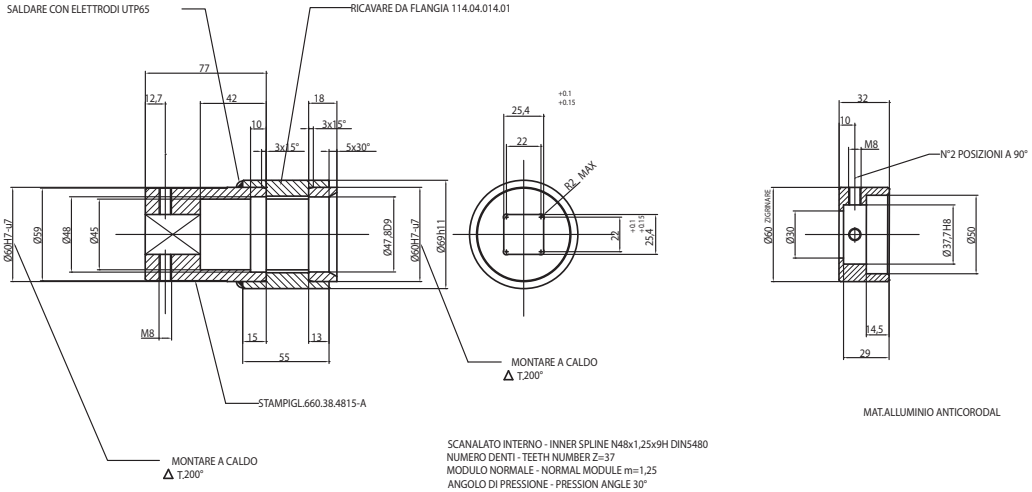
SPECIAL TOOLS

T1

P/N: 910.38.4819

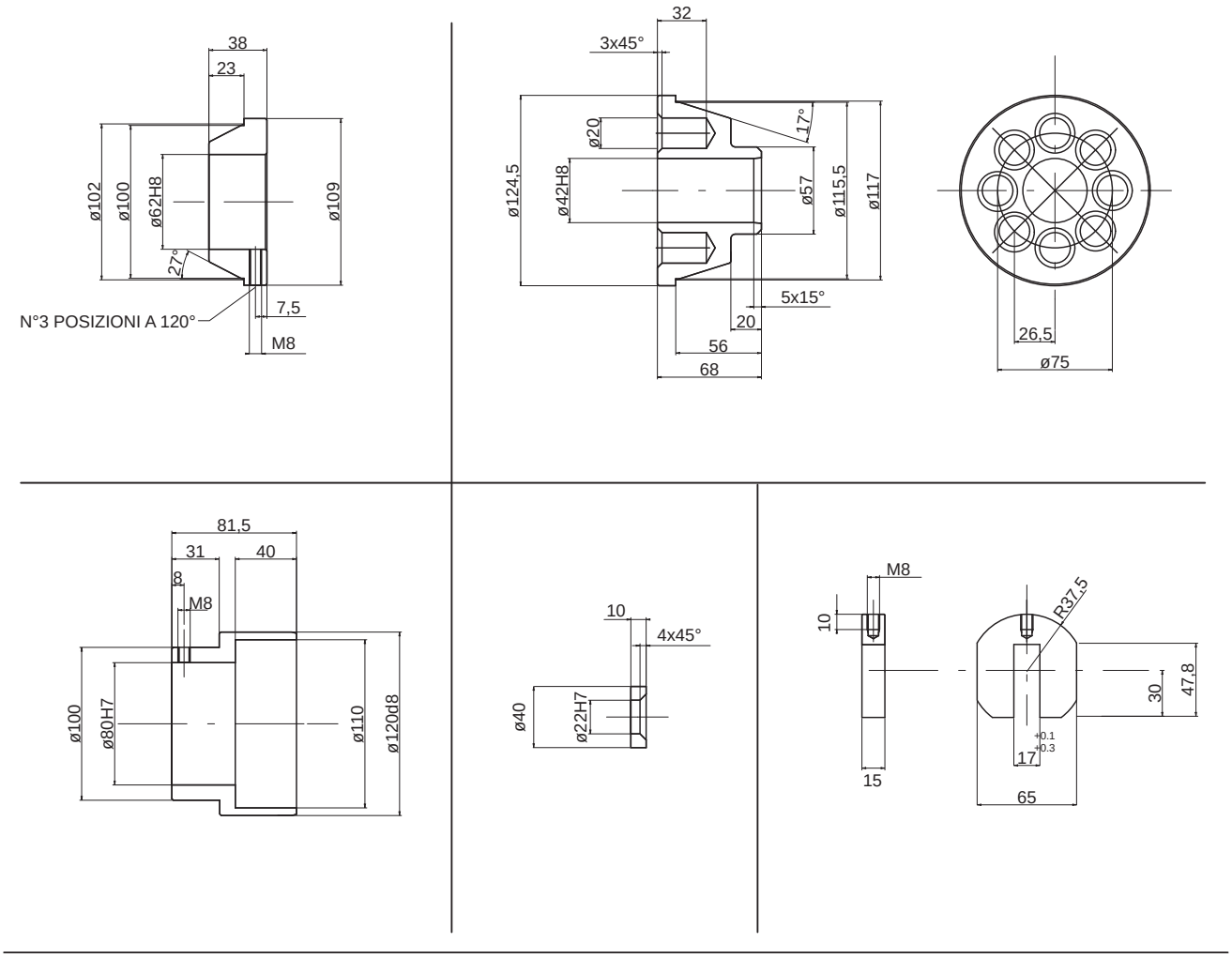






T2

P/N: 910.04.4583



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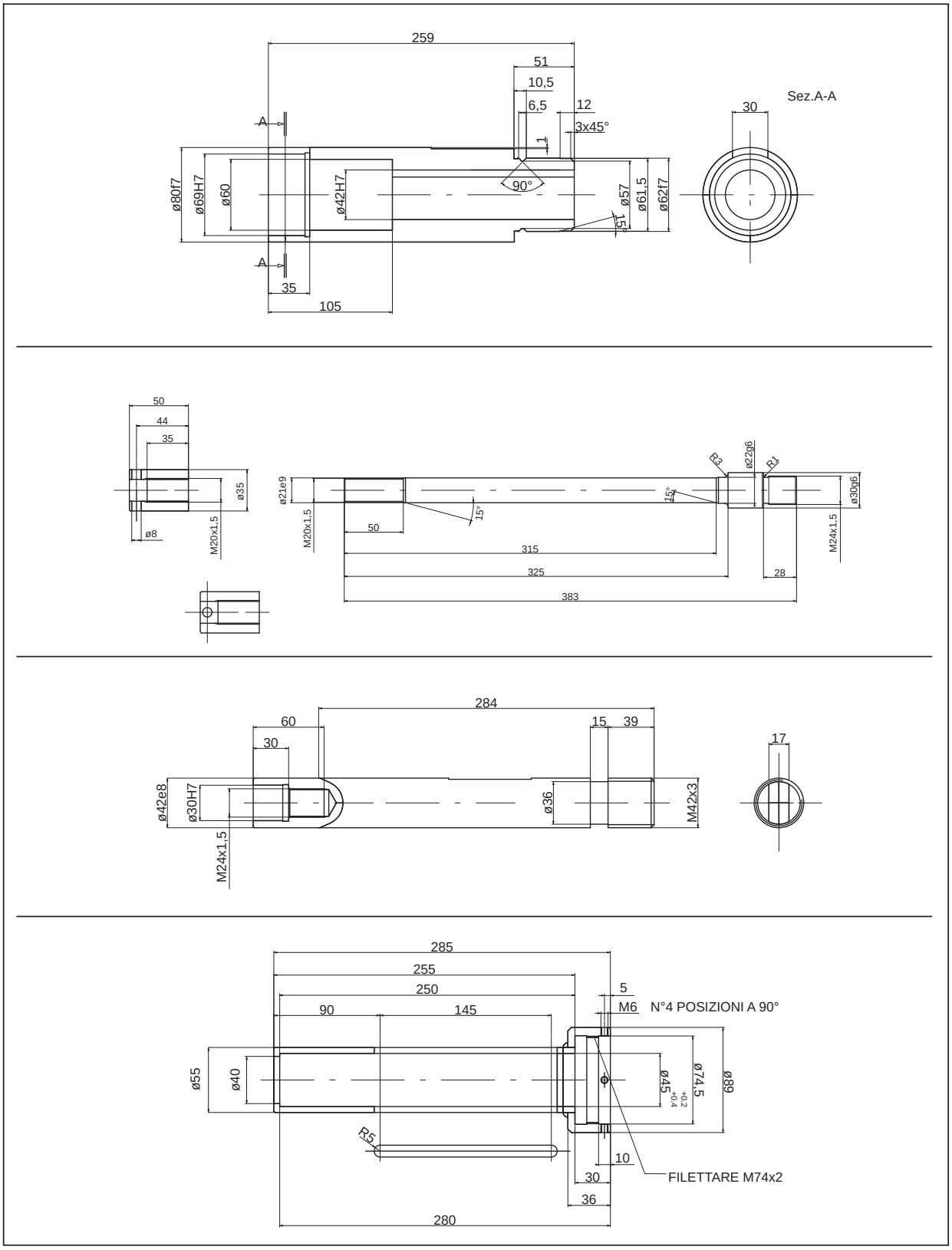
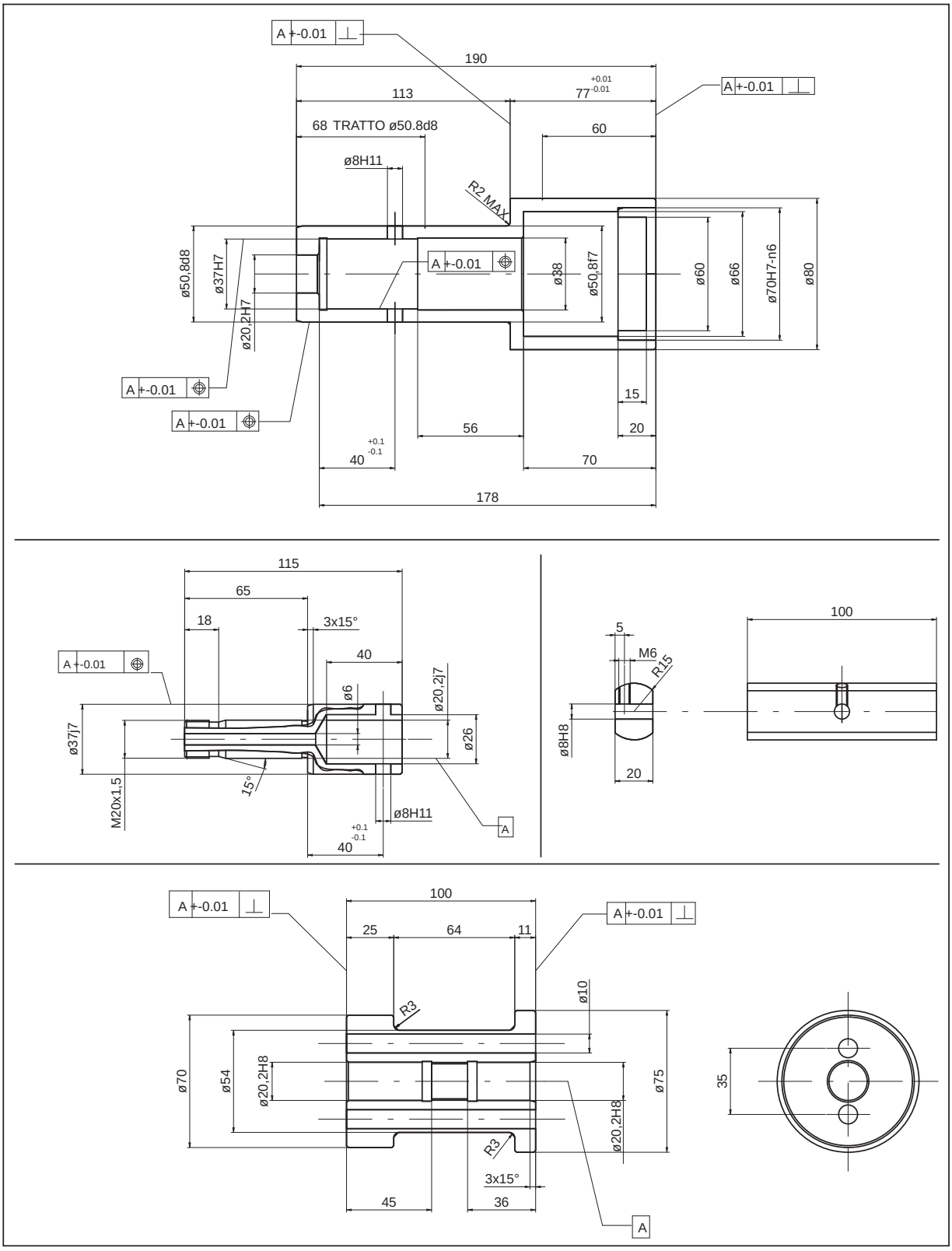


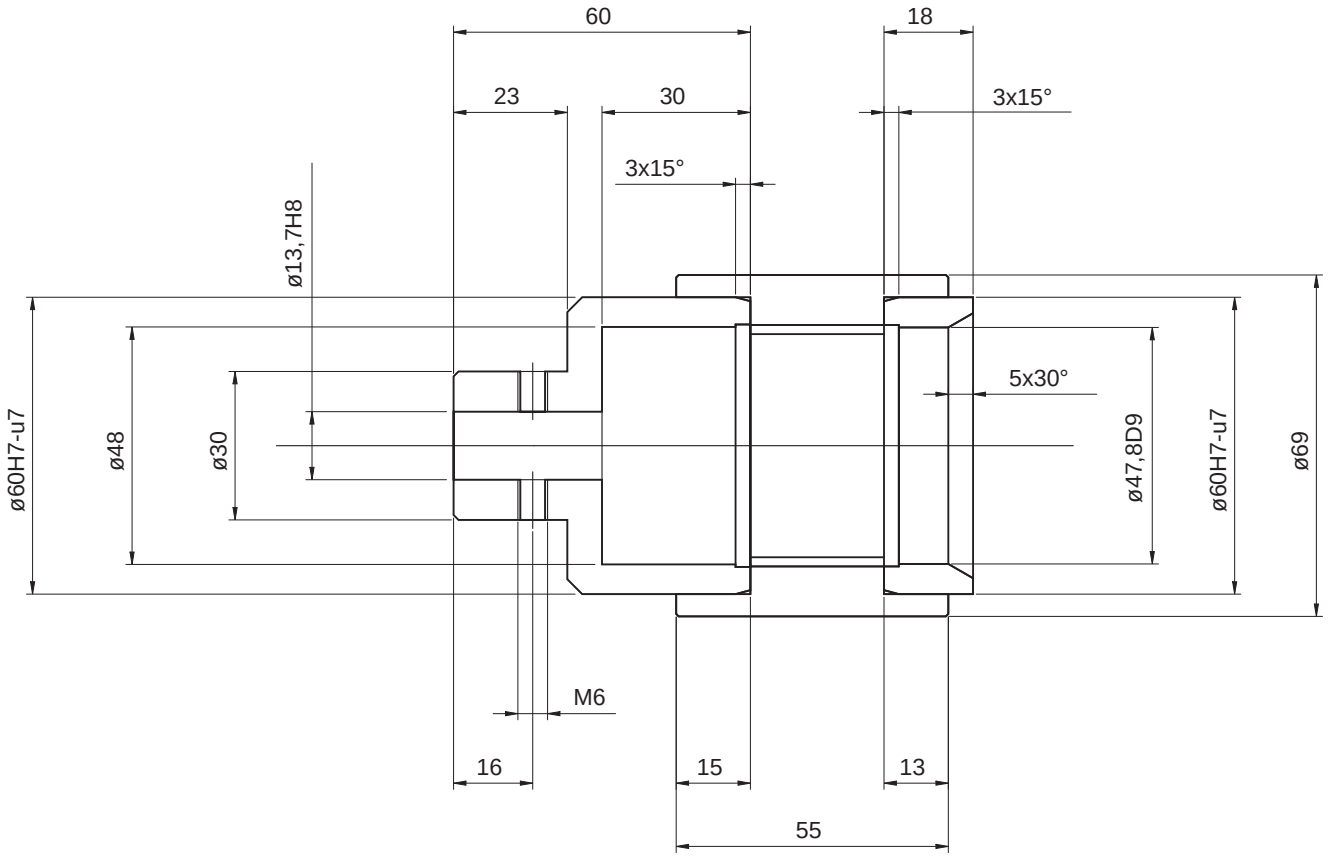
T3

P/N: 910.04.4584



T4

P/N: 910.04.4588



T5

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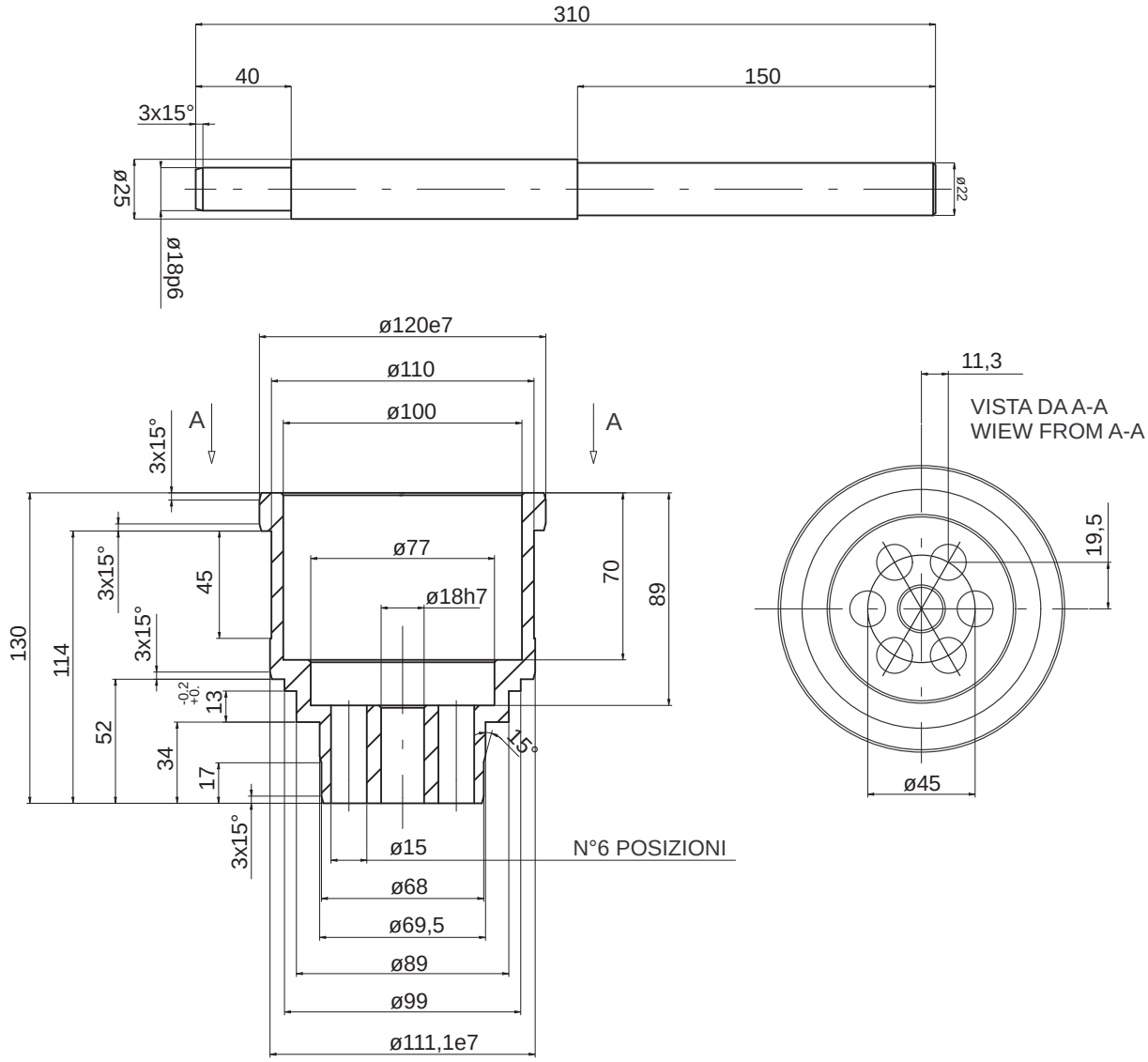
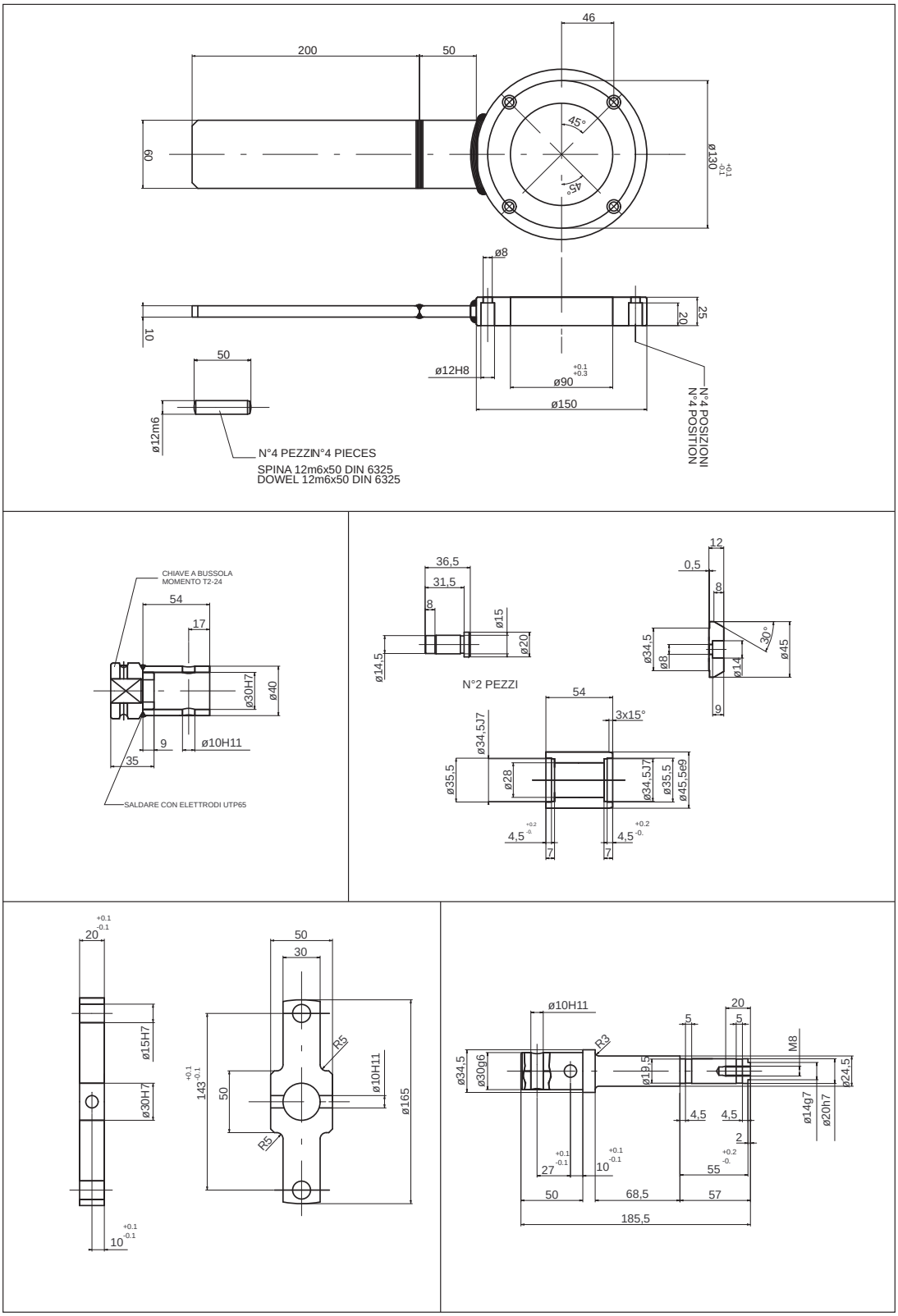


T6

P/N: 910.04.4590



T7

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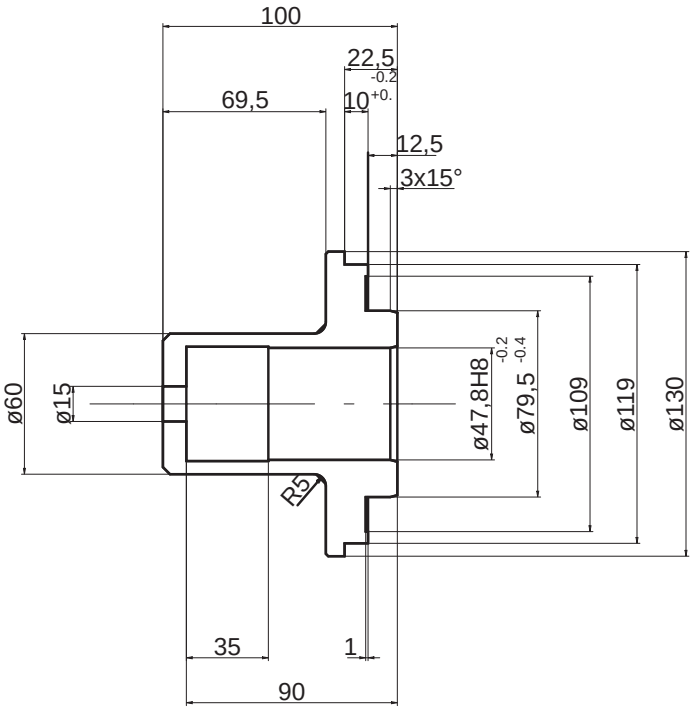

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